Heating Piping & Air Conditioning

DESIGN
INSTALLATION
OPERATION
MAINTENANCE

AUGUST ★ 1951

INDUSTRIAL
COMMERCIAL
INSTITUTIONAL AND
PUBLIC BUILDINGS

Page 101—Journal Section of The American Society of Heating and Ventilating Engineers

Gun type oil burners ignite horizontal rotaries ..... *page 73*

Restoring Equipment After Flood.....83

Selection of Piping Joints.....74

Equivalent Temperatures: What It Is.....87

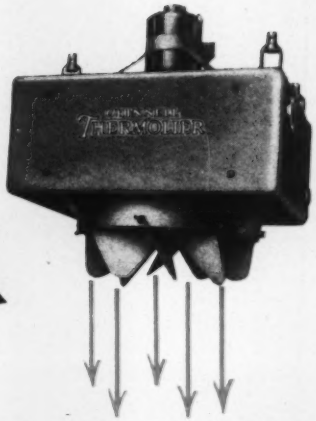
Tax Law and Your Profits.....96

THIS MONTH: MANY SHORT ARTICLES FOR EASY SUMMERTIME READING!

DOWNRIGHT

better performance

Vertical Delivery
THERMOLIER
Unit Heaters . . .

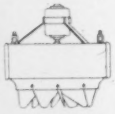


RIGHT DOWN

where maximum heat is desired...

in warehouses, plants and other hard-to-heat buildings

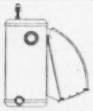
4 MODELS . . . . . 18 SIZES



Vertical Delivery

Horizontal Delivery

Textile Model



Velocity Nozzle

A thermostatic trap, the simplest and least expensive of all traps, is practical because of Thermolier's exclusive cooling leg.

Maximum capacity assured, annoying destructive water hammer eliminated — by built-in pitch of tubes and internal cooling leg which assure continuous drainage of condensate.

Damaging strains caused by expansion and contraction eliminated by "U" type expansion tubes.

Safety and durability assured with leak-proof tube-to-header construction.

Five other important construction features. Write for Thermolier Catalog.

HEATING COMFORT AND ECONOMY. Heat is forced down to the working level . . . not banked uselessly at the ceiling level. Thermoliers provide quick heating from a cold start. Desired room temperatures are easily maintained within a close range.

ADAPTABILITY TO EQUIPMENT AND FLOOR LAYOUT. The units and the simple piping are overhead where they do not interfere with arrangement of operating machinery or equipment and do not take up valuable floor or wall space. Units are easily relocated at any time to meet changes in plant layout or heating requirements.

LOW FIRST COST. Thermoliers are so efficient and so compact that their heating capacity is often equivalent to the capacity of cast iron radiation or pipe coils of twice the cost.

GRINNELL

WHENEVER PIPING IS INVOLVED

Grinnell Company Inc., Providence 1, Rhode Island • Sales Offices and Warehouses in Principal Cities

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco humidification and cooling systems

Tools of Air Conditioning

JOB IDEAS BY **usAIRco**

Look Mister, No Ducts!

Unique floor-by-floor installation in New York's B. Altman store, eliminates visible ductwork by introducing conditioned air at high velocities near ceiling along perimeter of building. No interruption of business.

Mystery solved! Note the enclosure labelled "Blouses". usAIRco Unit Air Conditioners have been placed in enclosures like this suspended from the ceiling, integrated into the architectural character of the store. Enclosures provide room for service man to move about freely. Backs are open to provide air intake without exposing equipment.

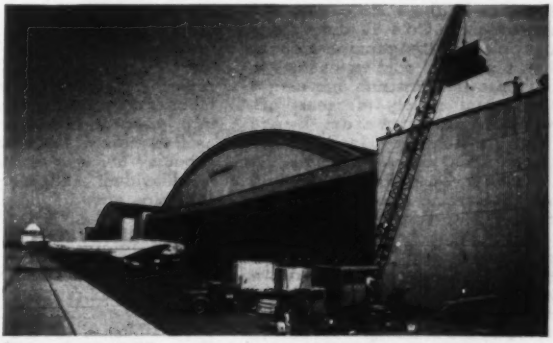
Main floor is conditioned by six usAIRco units. Three are placed off the floor in stair wells; three are suspended from basement ceiling. Conditioned air is introduced into store area by direct throw at velocities of about 1500 feet per minute near the 20-foot ceiling without creating air motion at floor. Pneumatic controls are used throughout.

High Speed Installation

TWO 20 TON SYSTEMS IN 3 WEEKS

For Pan American Airways

Coming up—many cool summers for the 500 office employees in the communications, dispatch and general offices of Pan American Airways at New York International Airport. Two self-contained usAIRco RK 20 ton units are used to cool the upper floors of the windowless structure between hangars. Units are located in penthouses, one on roof the other in an engine room.



usAIRco
Everything In Air Conditioning

UNITED STATES AIR CONDITIONING CORP.
3300 Como Avenue S. E., Minneapolis 14, Minn.

Please send your descriptive booklet: "Practical Pointers on Air Conditioning."

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Address_____

Firm_____

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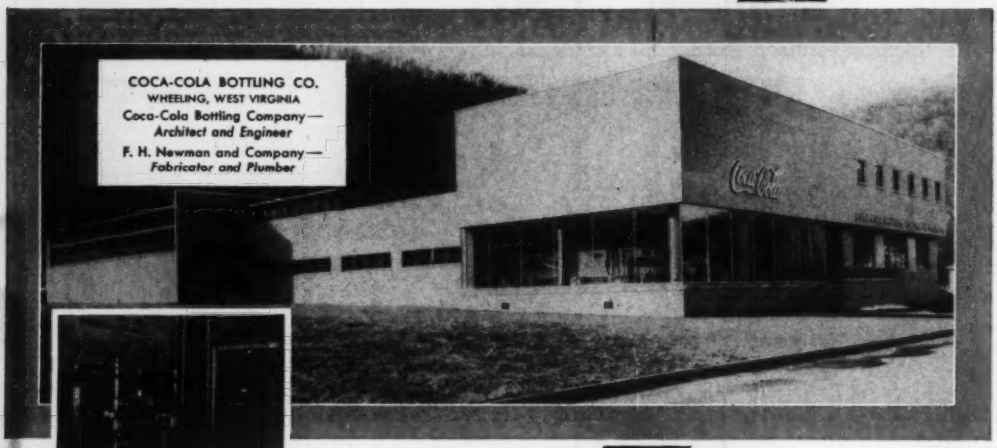
This Plant *"bottles-up"* Corrosion in COLD WATER LINES with BYERS WROUGHT IRON PIPE



Combining the pleasing architectural treatment and the sound mechanical design that invariably trade-marks these structures, this newest Coca-Cola Bottling Company plant utilizes genuine wrought iron pipe in all cold water lines to minimize maintenance and assure a constant supply of clear, uncontaminated water. Byers Wrought Iron pipe, in 3, 4, and 6-inch sizes, was used. This is the 30th Coca-Cola Bottling plant in which genuine wrought iron has been used to combat corrosion.

Byers Wrought Iron pipe has a proven record of long, dependable life in services where corrosive attack is a threat to durability. The most impressive histories are provided by old buildings where many original genuine wrought iron plumbing and heating lines are still serving after periods ranging up to half a century.

When pipe specifications are written, careful thought should be given to the consequences of failure. The expense of installing is material plus the pipe fitter's labor. The cost of repairing is material cost plus the labor of the pipe fitter, mason, plasterer, carpenter, painter—as many as five crafts. The wisdom and economy of using a durable pipe is self-evident. And Byers Wrought Iron pipe answers the need.

Our booklet, "THE ABC's OF WROUGHT IRON," tells how genuine wrought iron is made, where it is successfully serving, why it lasts longer. Ask for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. Export Division: New York, N. Y.

Why Genuine Wrought Iron Lasts

This notch-fracture test specimen illustrates the unusual fibrous structure of genuine wrought iron—which is responsible for the unusual corrosion resistance of the material. Tiny threads of glass-like silicate slag, distributed through the body of high-purity iron, halt and disperse corrosive attack, and discourage pitting and penetration. They also anchor the initial protective scale, which shields the underlying metal.

BYERS

CORROSION COSTS YOU MORE THAN WROUGHT IRON

WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

Heating Piping & Air Conditioning

Vol. 23, No. 8

(with which is merged the Aerologist)

DESIGN, INSTALLATION, OPERATION AND MAINTENANCE IN INDUSTRIAL, COMMERCIAL, INSTITUTIONAL AND PUBLIC BUILDINGS

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AUGUST 1951

Feature Articles

Matching Increasing Heat Demands With Efficient Service 69
L. C. Hardison and W. J. Pardubn

Air Conditioning Vital to Defense 72
Brief listing of applications

Gun Type Burners Ignite Horizontal Rotaries 73
M. A. Schneider

Factors Influencing Piping Joint Selection 74
G. W. Hauck

Check Plant Heating Now 79
Arthur J. Swartz

No Supplementary Heat for Ceiling Panel Installation 80
Fred F. Lange

New Handbook of Oil Burning Published 82
Book Review

After a Flood — Restoring Equipment to Service 83
What to do

Let's Speed Up the Fan! 84
Peter Franck

Equivalent Temperature — What It is 87
Thomas Bedford

Triple-Filtered Air for New Building 91
A "show" installation

Air Sanitation Important to Industrial Health 92
Allen D. Brandt

Snow Melting System — Experience Report 94
Rachel Goetchius

Regular Departments

The Editor's Pages 61
News and notes

"Open for Discussion" 65
Comment and criticism

Question of the Month 93
Can you answer it?

The Law and Your Profits 96
William Hurd Hillyer

Data Sheet — Selection of Pipe Wall Thickness 97
Two useful charts

Sam Lewis' Page 100
A popular feature

Equipment Developments 157
News of products

Who's What 172
Names in the news

New Books and Reports 182
For reference and use

Meetings and Conventions 190
The industry's calendar

Recent Trade Literature 194
Available on request

Index to Advertisers 204
In this issue

ASHVE Journal Section

Two-Year Performance of a Heat Pump System 101
Philip Sporn and E. R. Ambrose

Energy — Choose It Wisely Today for Safety Tomorrow 107
G. W. Gleeson

City of Roses Meeting Sets Attendance Record 115
The ASHVE at Portland

Summary of Chapter Meetings 125

Candidates for Membership 128

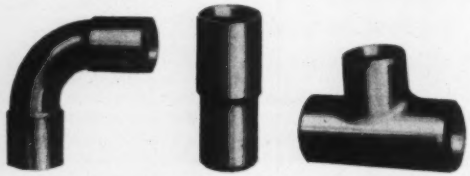
Officers, Council and Committees 131

look! ...it must be a Streamline® fitting!

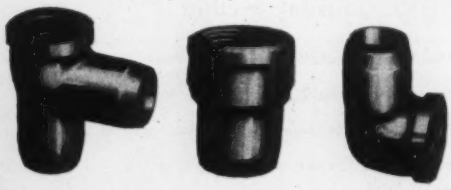
Streamline® solder type fittings are really made to last . . . and they'll make a neater, quicker installation

If Cleopatra's plumber had used STREAMLINE fittings we wouldn't be surprised if they would still be in pretty serviceable condition today. For STREAMLINE solder type fittings are really made to last. They cannot rust, they're not loosened by vibration and they're virtually free from clogging. STREAMLINE fittings assure a snug-fitting, tightly joined system that tests leak-proof on the first try and doesn't develop leaks later. When you install STREAMLINE fittings, you can be sure you're installing a permanently reliable conducting system whether for plumbing, heating, air conditioning or industrial use.

And here's something else . . . because of their design, precision manufacture and accurate dimensions, STREAMLINE solder type fittings can be installed quickly and the uniform depth of the solder joints makes it easy to compute the exact length of tubing needed. Thus STREAMLINE fittings not only assure a permanent installation, they also reduce job cost and increase the number of installations a contractor can handle.



STREAMLINE wrought and cast fittings are available in a complete range of standard sizes.



See your jobber for further information or write for catalogs S-351 and W-251 describing our complete line of STREAMLINE wrought copper and cast bronze fittings.

65

MUELLER BRASS CO. STREAMLINE PRODUCTS

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STRONGER FRAMES • REINFORCING RODS
MORE MEDIA • HOLDS MORE DIRT • EASIER TO CLEAN
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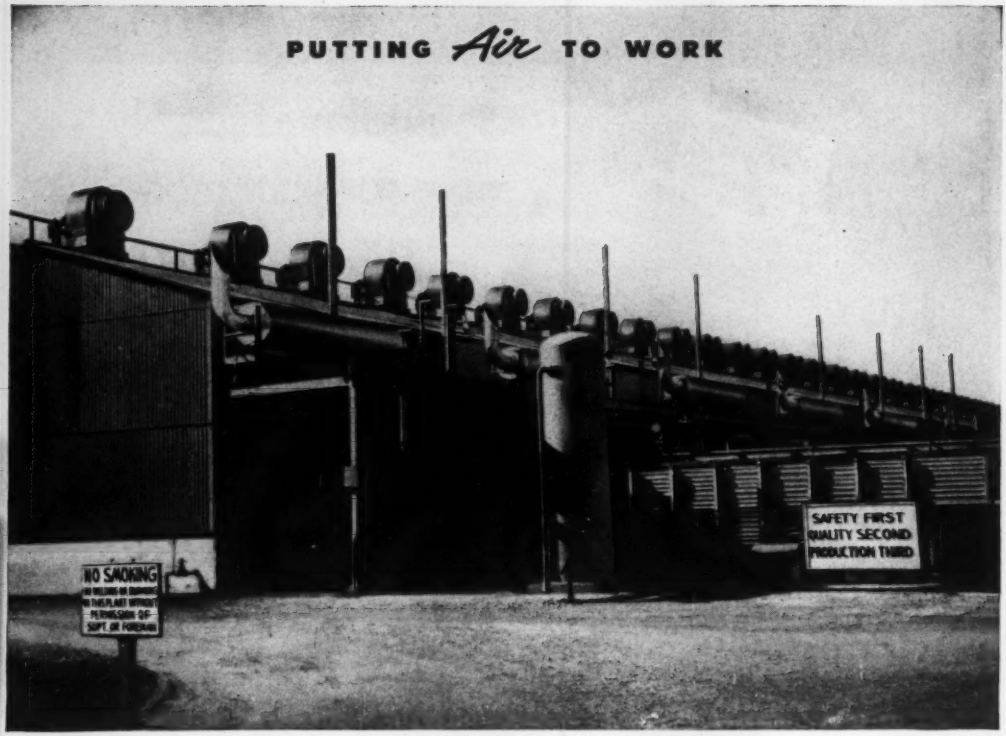

28 LUNGS THAT EXHALE AN EXPLOSIVE HAZARD

Every 60 seconds there must be a complete change of air in this building. Reason: to prevent the accumulation of explosive hydrogen, used in manufacturing ammonia. But what could be a dangerous process is made safe in one of the newest synthetic ammonia plants recently built in the Southwest by exhausting air through Sturtevant Elbow Axial Flow fans . . . 28 strong, right down the rooftop.

Strong north winds can't "back pedal" those fans . . . and rain is completely shut out. Motors, bearings and belts are located outside the air stream, an industry-proven advantage in exhausting corrosive fumes.

To meet the need for efficient fume or vapor removal in your plant—as well as air conditioning, air handling or air cleaning—there is Sturtevant equipment specifically designed to help you put air to work. Contact your local Sturtevant office, or write to Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Mass.

YOU CAN BE SURE...IF IT'S **Westinghouse**

J-80209

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How critical can you be?

You certainly have a right to be as critical as your requirements, and if those requirements happen to include pressure vessel outlets they are critical indeed.

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Typical Taylor Forge pressure vessel outlet fittings are illustrated above — nozzles, manways, welding necks, and related flanges. They are the embodiment of Taylor Forge engineering research and forging technique.

But whether it is the nozzle at the pressure vessel or the WeldELL or other Taylor Forge Fitting on the line, it always expresses the uncompromising standards of Taylor Forge.

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Incidentally, Wolverine has been manufacturing copper and copper base alloy tubing for well over thirty years.

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Whatever tube you can get, utilize it to the best advantage. Employ it judiciously and we shall all get along very well until the emergency is over.

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Lounge and exterior, Veterans Memorial Building, Detroit, Mich.
Architects and Engineers: Harley, Ellington & Day, Inc., Detroit, Mich.
General Contractors: Kuhne-Simmons Co., Inc., Detroit
Air Conditioning Contractors: American Refrigerating Co., Detroit

Simply beautiful

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adjustable air diffusers

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G. E.'s attractive units fit all decors, say Sheraton officials. They're simple to install without extensive building alterations. Maintenance is negligible.

Ventilation costs are low—existing buildings like the Sheratons often need no provision for additional ventilation.

Guests enjoy coming back to rooms where they can dial their own "personal weather." Yet they don't disturb others. Handsome G-E units are whisper-quiet. Chilled water for cooling and hot water for heating are supplied from a remote central plant.

Write now for free data on G-E Systems for hotels, apartments, office buildings, or see your architect, engineer, contractor. General Electric Company, Air Conditioning Division, Sec. H-20, Bloomfield, N. J.

SEE OUR CATALOG IN SWEET'S

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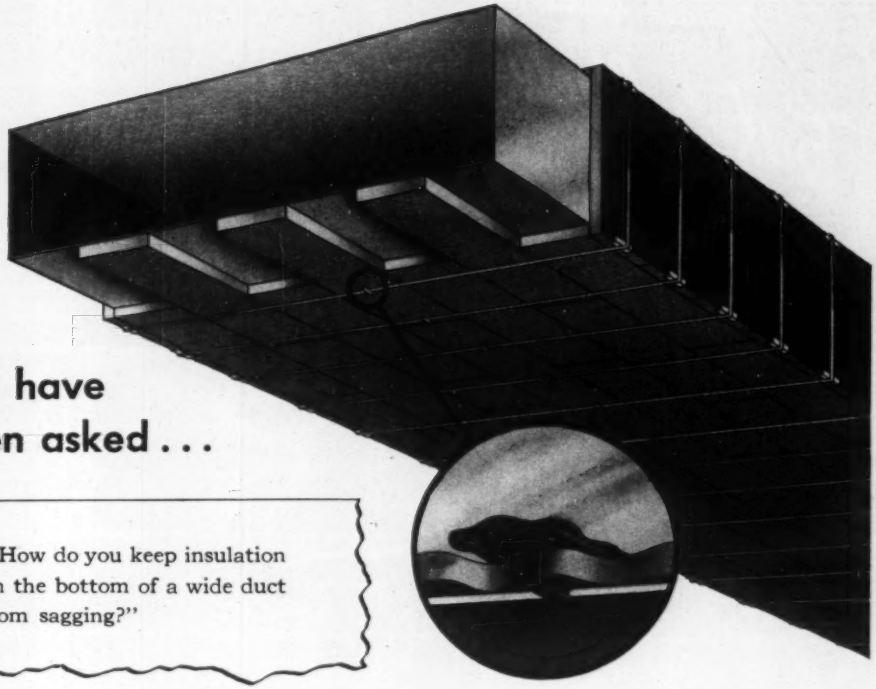


We have been asked . . .

"How do you keep insulation on the bottom of a wide duct from sagging?"

"We plan to cement corkboard to our air-conditioning ducts and then draw up metal bands around it," writes an engineer from a large weaving mill. "Will this method keep the corkboard from sagging on the bottom of wide ducts or should some extra support be used?"

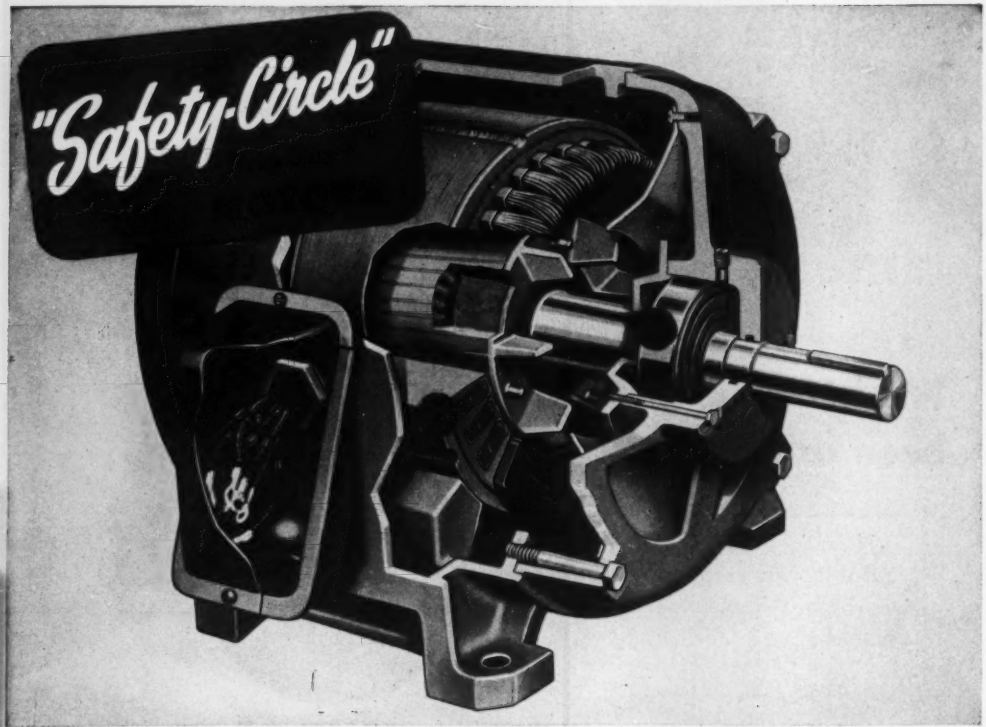
To answer this question we sent the engineer our specification for applying corkboard to air-conditioning ducts by the adhesive method. Here is the paragraph that pertains to his problem:

Spread Armstrong's No. 340 Adhesive over the entire surface of the corkboard with a square notched trowel and apply the corkboard to the duct surface. Additionally secure the corkboard with copper-clad wire ties or metal bands spaced on 12" centers. On ducts greater than 3' in any one dimension, use metal bands only. *Metal bands on the bottom of ducts wider than 6' shall be additionally secured to metal fasteners attached to the ducts with a suitable adhesive.* Sheet metal screws or other mechanical fasteners also may be used for this purpose.

Furnishing the right answers to questions on insulation problems is just one of the services offered by Armstrong. Our complete contracting organization also supplies top-quality insulation materials for air-conditioning systems and all other high- or low-temperature applications. The services of skilled workmen are also available. For a well organized insulation job, call Armstrong.

SEND US YOUR QUESTIONS: If you have any questions on the use of insulating materials or the construction of low-temperature facilities, please do not hesitate to write to us. We'll see that you get a practical answer. Just address a letter or post card to Armstrong Cork Company, 4408 Concord Street, Lancaster, Pa.

ARMSTRONG'S INDUSTRIAL INSULATIONS



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ELECTRICAL CONDUCTIVITY
THERMAL CONDUCTIVITY
LIFETIME DURABILITY
LASTING BEAUTY

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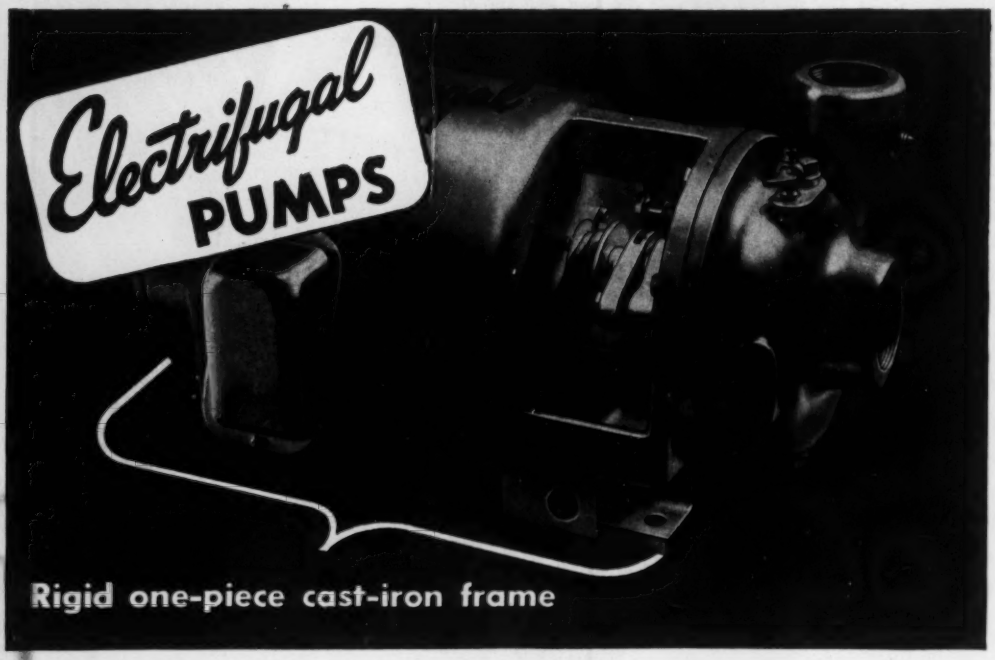
7 Convenient Warehouses to serve you promptly!

PITTSBURGH, 2850 Second Avenue • CLEVELAND, 5318 St. Clair Avenue • NEW YORK, 140 Sixth Avenue • CHICAGO, 3900 N. Elston Avenue • ST. LOUIS, 1620 Delmar Boulevard • PHILADELPHIA, 1632 Fairmount Avenue • CINCINNATI, 424 Commercial Square



This is the difference between close-coupled pumps

THIS EXCLUSIVE FRAME DESIGN combines maximum space for packing maintenance with exceptional rigidity in a way that no pump assembled to a standard motor can do. Solid cast iron frame with no joints from motor end housing to pump casing assures permanent alignment.

Bearings are lubricated at the factory and should require no attention for years. The stuffing box carries plenty of packing and all parts are generously proportioned for heavy duty service. Wearing rings and shaft sleeves protect casing and shaft from wear and are easily replaced at low cost when worn. As a result, you will find exceptional freedom from high maintenance costs.

Unit Responsibility Means Dependability

Motor and pump are designed for each other and made in the same plant. You have one responsible source for both... one guarantee of satisfaction. Every Allis-Chalmers pump representative is a competent application engineer who will help you select exactly the right pump for your needs. And 94 Allis-Chalmers Certified Service Shops provide nation-wide factory approved service.

Talk over your pump selection problems with your Allis-Chalmers Authorized Dealer or Sales Representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin for Bulletin 52B6140.

A-3337

Electrifugal, Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS

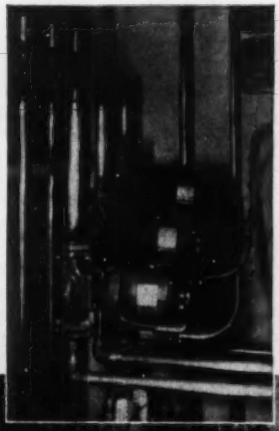
Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.



"House of Ideas"

Sponsored by House & Garden

Selects

Hydro-Flo* Heating

Zoned for better heat control

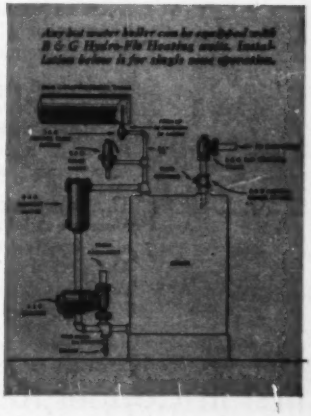
The heating system of the "House of Ideas" is divided into three zones, individually controlled by the B & G *Hydro-Flo* Booster Pumps illustrated above. Zoning provides compensation for varying exposures and, if desired, permits different temperatures in different parts of the house.

In the "House of Ideas", sponsored by HOUSE & GARDEN, beauty and convenience are fully supplemented by winter comfort. A *completely concealed* B & G *Hydro-Flo* Radiant Panel Heating System distributes radiant sunny warmth throughout.

B & G *Hydro-Flo* Heating is a *forced hot water system* . . . which means that the heat supply is always under positive control. The temperature of the water circulating through the system is automatically raised or lowered to meet every change in the weather. Even in spring and fall, when only a little warmth is needed, indoor temperature is kept exactly at the comfort level—no wasteful overheating.

That's why a B & G *Hydro-Flo* Heating System costs so little to operate—it matches fuel consumption to weather conditions. This ultra-modern system permits a choice of *baseboard panels, convectors, radiators or radiant panels.*

B & G *Hydro-Flo* Heating adds plus value to any home—increases saleability. Send for free booklet, "Capture the Sun with B & G *Hydro-Flo* Heating."



BELL & GOSSETT
COMPANY

Dept. CD-5, Morton Grove, Ill.

Canadian Licensee: S.A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto, Canada *Reg. U.S. Pat. Off.

COPPER

—most versatile metal known to Industry

Liquid Coolers made by L'Air Liquide Society of Montreal, Canada. Each uses 20,000 ft. of tubing which carries liquid air. Tubes are of annealed deoxidized copper, 0.394" O.D. x 0.0394" wall. Tube sheets are cast bronze.

This equipment, known as Liquid Coolers and used in the production of oxygen, is made of deoxidized copper tubing. The combination of properties demanded of copper—high thermal conductivity, ductility and easy workability, strength, resistance to corrosion—illustrates the versatility of copper and explains its great usefulness to industry.

Copper and copper alloys offer the useful properties required for building efficient and economical processing equipment. Depending on composition, they possess combinations of strength, corrosion resistance, high thermal and electrical conductivity, plus free machining, easy forming, and good welding characteristics.

The experience and help of Anaconda's Technical Department are always available to you in selecting the right copper or copper alloy for your needs or for any problem connected with these metals. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

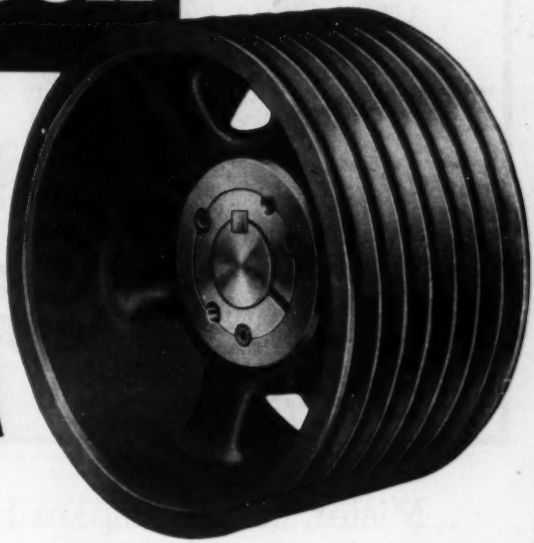
first in Copper, Brass and Bronze **ANACONDA**®

There's only one TAPER-LOCK

Precision-Grooved

True Running

Easy on—Easy off



TAPER-LOCK bushing grips the shaft for the full length of the bushing — holds sheave with firmness of a shrunk-on fit. No wobble. Taper-Lock runs true!

No flange—no collar—no protruding parts. Flush machine-tool appearance.

Finest grade of close-grained semi-steel, cast in the Dodge foundry.

The grooves, machined on precision equipment, have identical pitch diameters. This insures equal belt tension. Every belt pulls its share of the load!

TAPER-LOCK sheaves are available from distributors' stocks in complete range of sizes in A, B, C and D grooves.

DODGE SEALED-LIFE BELTS have special protection for tension members, insuring longer belt life. Perfectly matched to TAPER-LOCK sheaves.

DODGE MANUFACTURING CORPORATION, 1600 Union Street, Mishawaka, Ind.

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified phone book.

FIRST IN POWER TRANSMISSION MACHINERY!

V-BELTS AND TAPER-LOCK SHEAVES

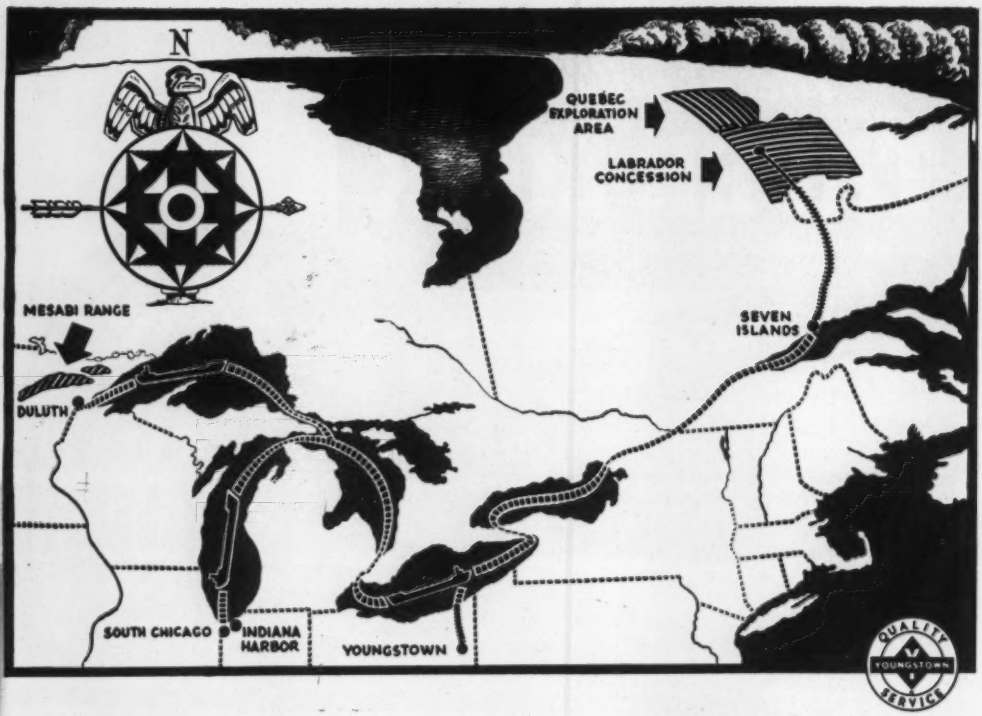
DODGE-TIMKEN PILLOW BLOCKS

ROLLING GRIP AND DIAMOND D CLUTCHES

SOLID STEEL CONVEYOR PULLEYS

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO, ILLINOIS



Mister, can you spare Half a Billion Dollars?

ONE half a billion dollars may seem like pin money compared to the sums mentioned for our national finances.

But it is more than three dollars for each man, woman and child in the United States. It is more than the entire steel industry earned in the "dreadful decade" from 1930 to 1939. It's more than America spent to win two wars--the War of 1812 and the Mexican War, combined.

Approximately one half a billion dollars is the estimated sum that a group of steel and mining companies, one of which is The Youngstown Sheet and Tube Company, is investing to guarantee future iron ore supplies for America. In the Mesabi iron range of Minnesota, development projects are under way which will produce millions of tons of iron concentrates from taconite. In Labrador and Quebec, a vast deposit of high grade ore is being developed. Plans include building a 360-mile railroad into the wilderness to ore docks on the St. Lawrence River.

Where does this money come from? From an unnoticed addition to our national debt? From "extra nickels" tucked away in the Federal budget? From more taxes levied on every citizen's income? *Certainly not!* Development of these ore reserves will be financed by each participating Company asking its shareholders to share in its tremendous cost.

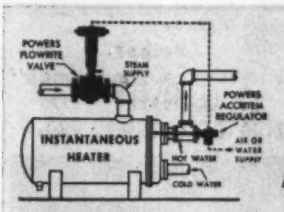
America, in peace or in war, is served--now --and for generations to come. This is free enterprise. This is the system that created America from a wilderness and is the only sure way to keep it vigorous and strong.

Scrap Metal is Critical Again

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.



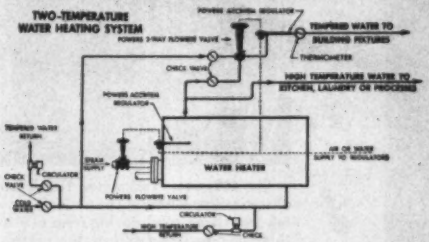
POWERS

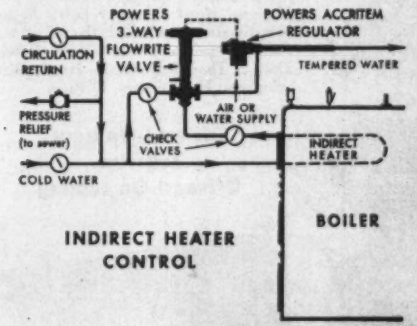
ACCRITEM REG

Easy to adjust

Compressed air or water operated

Only a few of many uses





INDIRECT HEATER CONTROL

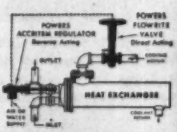
Gives

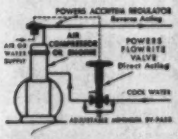
Accurate, Low-cost Heat Control

Use Accritem Regulators to control diaphragm operated valves or dampers. They save labor, stop losses caused by over-heating and have the following—

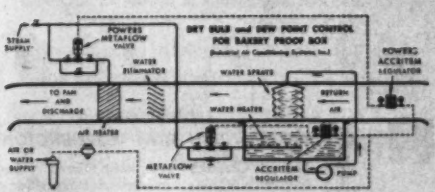
IMPORTANT ADVANTAGES

- ***Adjustable Sensitivity*** and over-heat protection.
- ***Calibrated Dial*** temperature adjustment.
- ***Simple, Rugged Construction*** withstands vibration and insures many years of reliable service.
- ***Temperature Ranges*** 50 to 250° F. and 150 to 350° F.
- ***Easy to Install*** Requires 15 lb. supply of compressed air or water for its operation.
- ***Small Size***—regulator head is only 2⅞″ x 3⅝″, sensitive bulb is 12″ long with ½″ I.P.S. connection.




POWERS ACCRITEM REGULATOR Reverse Acting
AIR COMPRESSOR OR ENGINE
POWERS FLOWRITE VALVE Direct Acting
AIR OR WATER SUPPLY
COLD WATER

FLOWRITE and METAFLOW
Diaphragm Valves
controlled by a POWERS
ACCRITEM HEAT REGULATOR
provide an unbeatable combination for *better control and lower maintenance*



Write for Bulletin 316—or phone our nearest office for prices and further information about POWERS ACCRITEM regulators and diaphragm valves.

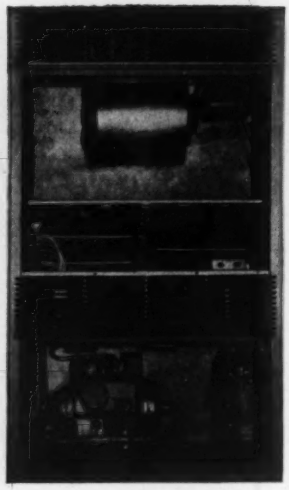
THE POWERS REGULATOR CO.

OFFICES IN OVER 50 CITIES • See Your Phone Book
CHICAGO 14, ILL., 2720 Greenview Ave. • NEW YORK 17, N.Y., 231 E. 46th St.
LOS ANGELES 5, CAL., 1808 West 8th St. • TORONTO, ONT., 195 Spadina Ave.
MEXICO, D. F., Apartado 63 Bis.

(A.M.H.)

60 Years of Temperature and Humidity Control

EVERYTHING YOUR CUSTOMER WANTS



IN A PACKAGE AIR CONDITIONER

Here are the reasons why your customer will be happy with his Worthington Package Air Conditioner:

QUIET—acoustically insulated cabinet . . . no belts to wear or get out of line.

VIBRATION-LESS—smooth-floating multi-mounted compressor . . . dynamically-balanced fan.

TROUBLE-FREE—compressor hermetically-sealed against dust and moisture . . . no pulleys, couplings or seals.

NO ATTENTION NEEDED—pressure-type oiling . . . never needs replenishing.

LONG LIFE—compressor surfaces finished to micro-inch accuracy . . . oversize bearings . . . four rings per piston . . . dynamically-balanced crankshaft.

SAFE—high-pressure cut-out . . . high temperature safety switch.

CONVENIENT—finger-tip selection of temperature . . . thermostatic control . . . finger-tip adjustment of louvres.

ATTRACTIVE—plastic baked-enamel finish, scratch-resisting, washable . . . rounded corners, no projections . . . no "sweating".

ECONOMICAL—thermally-insulated . . . large copper-finned cooling coils . . . Worthington Feather* Valves.

Each Worthington unit—3, 5 and 7½ ton sizes**—is built to the same high quality standards as Worthington equipment for engineered systems, such as those described at the right. *Write for Bulletin C1100-B29.*

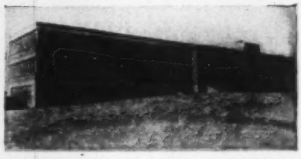
*Reg. U. S. Pat. Off. **Also, for remote location: 7½, 10, 15, 20, 25 ton units

Another "Worthington-Conditioned" hotel

in the National Hotel Co. chain

The 400-room Washington Hotel, one of the leading hotels in the nation's capital, gets its air conditioning from a Worthington centrifugal refrigeration system, using chilled water. This is one of five National Hotel Company hotels to be Worthington-conditioned; the others are Hotel Jung, New Orleans; Travis Hotel, Dallas; Thomas Jefferson Hotel, Birmingham; Hotel Cortez, El Paso.

Off-and-On heat calls for Off-and-On cooling



The work performed in the research laboratory of Aluminum Company of America, East St. Louis, Ill., is of such a nature that excessive heat is produced intermittently.

Certain of the rooms are provided with a "wild zone" of air conditioning which goes into operation automatically when the heat-producing equipment is in use, and the normal air conditioning zone cannot handle the load.

This building is handled by a 125-ton Worthington air conditioning system comprising of two Freon-12 compressors and one evaporative condenser.

WORTHINGTON

AIR CONDITIONING AND REFRIGERATION

INVESTIGATE

MORE WORTH WITH WORTHINGTON

Consult Classified Telephone Directory for nearest Worthington distributor. Worthington Pump and Machinery Corporation, Air Conditioning and Refrigeration Division, Harrison, N. J., specialists in air conditioning and refrigeration for more than 50 years. A3.3

Century 1 TO 400 H. P. MOTORS

Choose From These Many Types To Fit Your Job

DEPENDABLE CONSTRUCTION . . . Plus

PROPER SELECTION MINIMIZE SHUTDOWNS

Century Electric Company is celebrating its 50th year in the electrical industry.

It's easy to select the proper electric motor for your job from Century's complete line — from 1/6 to 400 horsepower. A wide range of types and kinds are available to satisfy all popular requirements. They are carefully designed, built and tested to assure maximum performance throughout their long life.

Here are examples of Century's line of INTEGRAL HORSEPOWER motors.

Polyphase

TYPE SC—Open Drip proof General Purpose Motor. Meets the needs of most installations where operating conditions are relatively clean and dry.

TYPE SC—Splash proof. Supplies protection where plants must be washed down. Keeps out all falling or splashing liquids—rain, snow, sleet, etc.

TYPE SC—Totally Enclosed Fan Cooled. Protects against dusts, mist, oil, fog. Inner frame protects vital parts of the motor, seals out harmful matter.

TYPE SC—Explosion proof. Protects life and property in atmospheres charged with explosive dusts or gases.

TYPE SR—Wound Rotor. Open Construction. Ideal for applications requiring low starting current with high starting torque, reversing or adjustable speed.

TYPE SR—Wound Rotor Splash proof. Same electrical characteristics as motor shown above. In addition, gives adequate protection against falling and splashing liquids.

Single Phase

TYPE RS—Repulsion Start Induction, Open Construction, Single Phase Brush Lifting Motor. Combines high starting torque with low starting current.

883

TYPE RS—Splash proof. Same advantages as open construction, plus protection against splashing and falling liquids.

TYPE CSH—Capacitor Start Induction, Single Phase Motor. Suitable when high starting torque with normal starting current is satisfactory.

TYPE CSH—Splash proof. Same advantages as motor shown above, plus protection against falling and splashing liquids.

Direct Current

TYPE DN—Direct Current Motors. Suitable for use where direct current is available, or its use desirable.

TYPE DN—Direct Current, Splash proof.

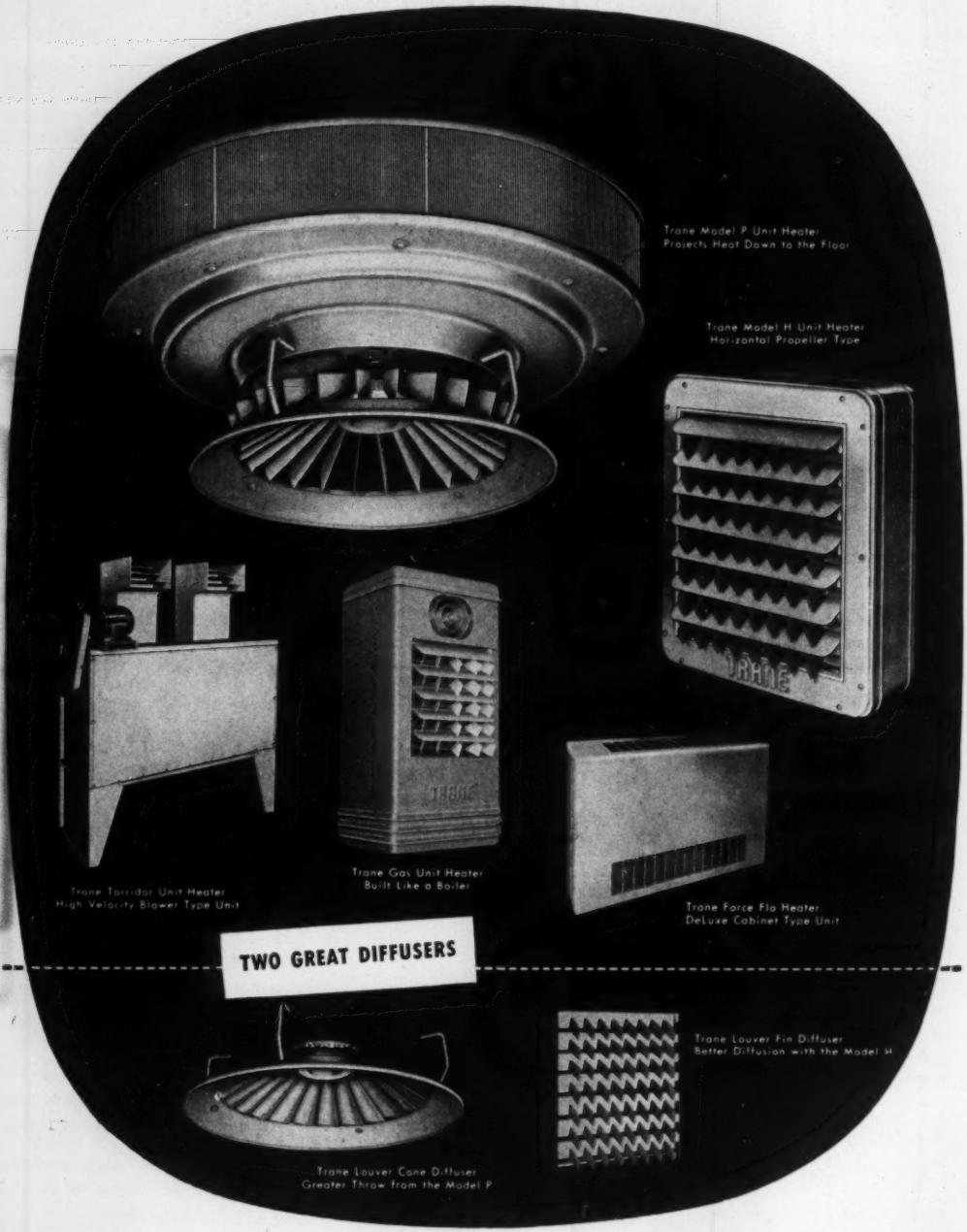
TYPE SY—Synchronous. Suitable for continuous operation at a uniform load for power factor correction.

In addition to a complete line of integral horsepower motors, Century offers fractional horsepower motors, gear motors, generators, AC and DC motor generator sets.

For a long life of satisfactory performance, specify Century motors for all your electric power requirements.

CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Missouri • Offices and Stock Points in Principal Cities

Not One But Five


Trane Model P Unit Heater
Projects Heat Down to the Floor
Trane Model H Unit Heater
Horizontal Propeller Type
Trane Corridor Unit Heater
High Velocity Blower Type Unit
Trane Gas Unit Heater
Built Like a Boiler
Trane Force Flo Heater
DeLuxe Cabinet Type Unit
TWO GREAT DIFFUSERS
Trane Louver Fin Diffuser
Better Diffusion with the Model H
Trane Louver Cone Diffuser
Greater Throw from the Model P

MANUFACTURING ENGINEERS OF VENTILATING,

Great Unit Heaters

Another Example of the Completeness of the Trane Heating Line

Not one, not two, but five great Trane Unit Heaters to solve your heating problems exactly. Whether you need a unit for steam, hot water or gas; whether you want vertical discharge or horizontal throw; whether you want to blanket doorways or heat entries – no matter what the unit heater application, there is a Trane product that will fit the project perfectly. Only Trane offers such a complete unit heater line.

Unit Heater Diffusers. Not only is the line complete but it is jam-packed with exclusive Trane features. Outstanding examples are the Trane Louver Cone and Louver Fin Diffusers. With them you put heat exactly where you want it. You can get greater distance of throw. You can change adjustments easily and quickly when job requirements change. You can split the air stream into segments making it possible for one unit to do the work of two. With this greatly increased unit flexibility, you get greater value for your heating dollar.

The Trane Coil. Still another feature is the Trane Coil – the heart of all steam and hot water units. This is the coil that gives you the solderless mechanical bond for greater heat transfer, the rolled and bushed header joint for leakproof operation, the six-step fin construction for greater sturdiness.

Exclusive features plus five units from which to choose – that's why you'll find the best answer to your unit heater problem in the Trane line.

A Complete Heating Line. You'll also find the right answer to hundreds of other problems in Trane's complete line of heating, ventilating, heat exchange and air conditioning products. Like Trane Unit Heaters, each product offers a wide range of types and sizes from which to select. All are studded with exclusive Trane features. And when you incorporate them into complete systems, you get the added advantages of using products that are designed, tested and built together for service together. Whatever your heating, air conditioning or air handling problem, look for the answer in the complete Trane line.

Trane Unit Ventilators—for better schoolroom ventilation | Trane Centrifugal Fans—a complete line with wheels diameter to 109" | Trane Heating Coils—ideal for the central heating system | Trane Steam Specialties—a complete array of traps and valves | Trane Convectors—the room heater that tucks away under the window

THE TRANE COMPANY, LA CROSSE, WISCONSIN

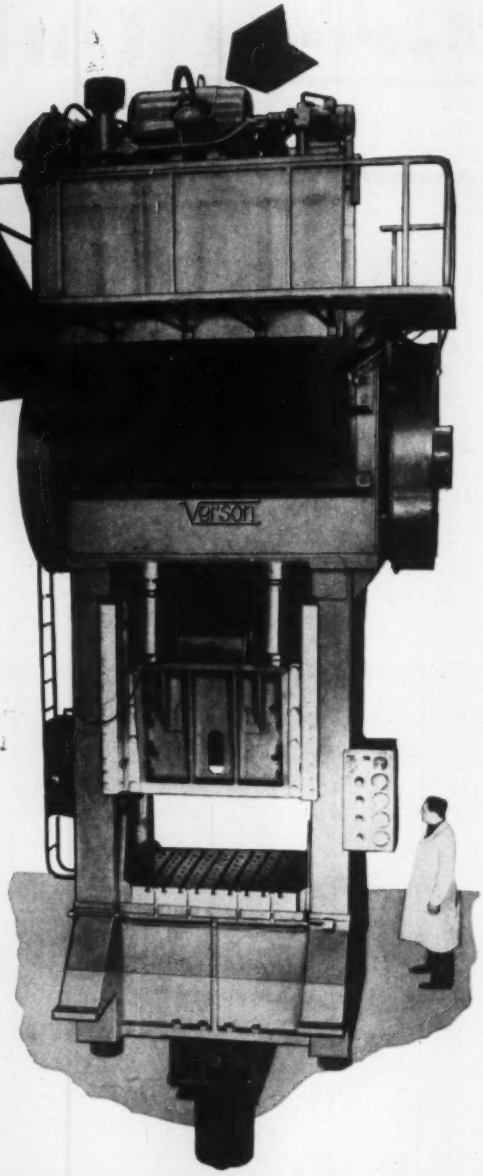
Eastern Mfg. Division, Scranton, Pennsylvania
Trane Company of Canada, Ltd. . . . Toronto

OFFICES IN 80 U.S. AND 14 CANADIAN CITIES

TRANE

HEATING AND AIR CONDITIONING EQUIPMENT

Machine with a POWERHOUSE PUNCH!



In one mighty blow, this giant 850-ton, double-action, deep-drawing Verson Allsteel press forms an intricate automobile part.

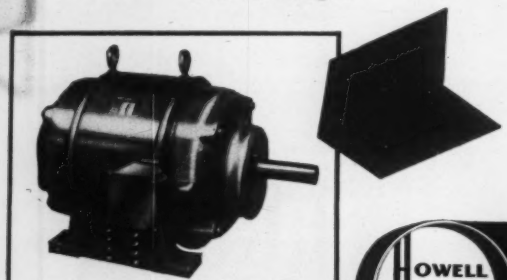
Multiply this by seven strokes a minute, 3 shifts a day, seven days a week and you have a rugged operating schedule . . . one which the Howell motors that power this fine press take right in stride.

Howell engineers worked closely with this manufacturer to select the *right* motor for each job. The main drive motor is a Howell 50 H.P. high slip, high torque motor designed specially for punch press work. The self-adjusting blankholder is driven by a hydraulic pump, powered by a 50 H.P. Howell motor. A 20 H.P. Howell motor operates another hydraulic drive.

Howell will devote the same care and attention to your electric motor problems and needs. With this cooperation and Howell quality, you're assured of motors that will stand up under the heaviest production load over long periods without interruption.

May we help you?

HOWELL ELECTRIC MOTORS COMPANY
Howell, Michigan

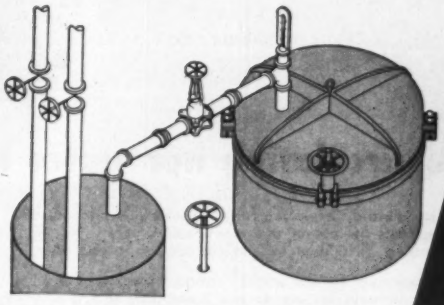


Howell Type F Motor. A high slip, high torque motor designed for punching and shearing operations. Sizes ½ to 200 H.P. in open frames; ½ to 125 H.P. in enclosed frames.

HOWELL Red Band MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.
Precision-built industrial motors since 1915

for outstanding service like this



The Installation—Phoenix Dye Works, Chicago, Ill.

PROBLEM: To find a durable replacement valve for dye line on package dye machine. Various cocks and valves tried, lasting only a maximum of 1 to 2 months, with much leakage, sticking, and maintenance.

WORKING CONDITIONS: Valve almost constantly in contact with varying acid dye solutions, at temperatures ranging from 50 to 210 degrees F. Operated about 100 times daily, often with disc in throttling position.

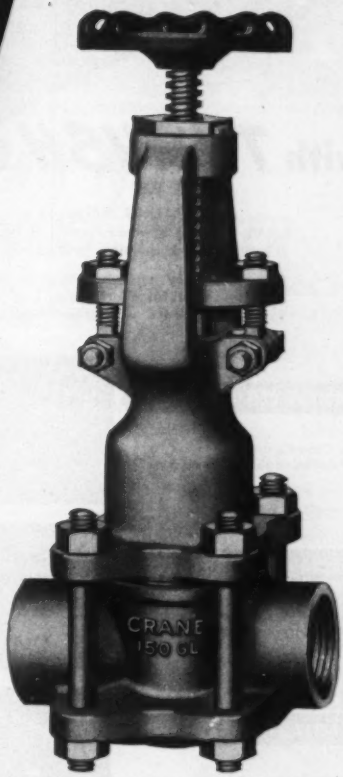
SOLUTION: Crane No. 18850, all 18-8 Mo Stainless Steel Plug Gate Valve.

RESULT: User reports: after more than 3 years' uninterrupted service, no leakage through valve . . . no sign of corrosion . . . no maintenance expense . . . unusually easy operation. Enthusiastic about performance of Crane Plug Gate Valves.

. . . Another typical example of the long life and low-cost upkeep that Crane Quality Valves are famous for. And that's why . . .

More CRANE VALVES are used than any other make!

Rely on Dependable CRANE VALVES



No. 18850 Crane 18-8 Mo Plug Gate Valve for throttling or full-flow service. (No. 17750 in Monel.) Send for new folder AD-1855.

CRANE CO.

General Offices:
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

you can offer your customers

Radiant Heat

IN ALL THE NEW MODERN METHODS

HORIZONTAL WATER CIRCULATOR

with *THRUSH* forced circulating hot water heat

HEATING METHODS are on the march! Forced Circulating Hot Water Heat, which offers the mildest and most uniform heating, also permits the use of many new and modern heating methods not possible with other forms of heating. It is ideal for radiant heating in any form.

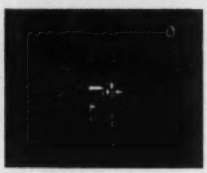
Thrush System gives precise control of temperature for hot water heating, completely eliminates wasteful overheating and assures that continuous feeling of well-being due to the constant presence of radiant heat.

RADIANT CEILING PANELS

Thrush Controls are economical, in both installation and operating costs.

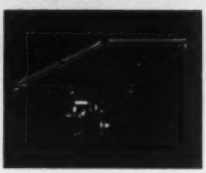
RADIANT FLOOR PANELS

Thrush Controls provide continuous warmth with economical Circulator operation.



RADIANT BASEBOARD

Thrush Controls maintain comfort, compensate for outdoor weather changes.



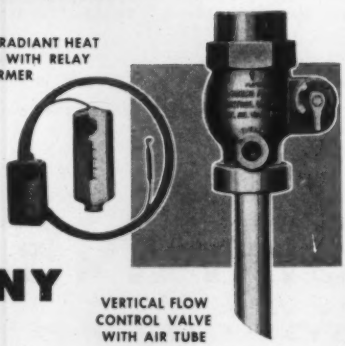
RADIATORS · CONVECTORS

Uniform Heat is always present with Thrush Flow Control System on the job.

ZONE CONTROL

Inexpensive zoning with a Circulator, Flow Valve, and No. 201 Control for each zone.

NO. 201 RADIANT HEAT CONTROL WITH RELAY TRANSFORMER

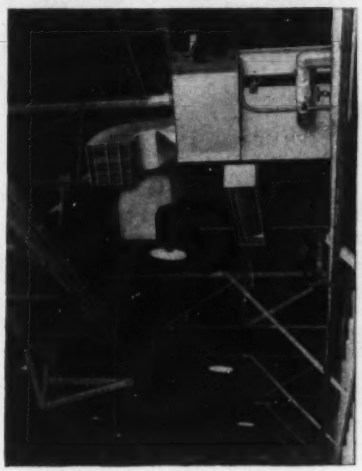


VERTICAL FLOW CONTROL VALVE WITH AIR TUBE

Ask your wholesaler or write dept. C-8.

H. A. THRUSH & COMPANY

PERU · INDIANA



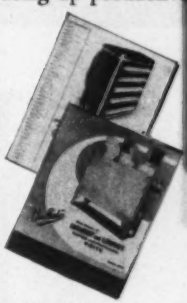
SUSPENDED — OUT OF THE WAY!

"Buffalo" LOWBOY heaters take no floor space. Unit has efficient "Buffalo" fan for positive heat throw, and can be used for straight ventilation in warm weather. LOWBOY heaters are also used to supply make up air in plants, mills and foundries where exhausters are used extensively.

PLAN NOW FOR NEXT WINTER

QUALITY-BUILT HEATING, VENTILATING AND FRESH AIR UNITS — A RIGHT MODEL FOR EVERY TYPE OF INSTALLATION

Getting the heat to the worker, or to the working area can sometimes be a problem — but not with the complete range of models in the "Buffalo" Unit Heater line. This line includes everything from the efficient BREEZO-FIN heaters which can throw heat down over a section of benches or machines — to the big HIGHBOY and LOWBOY heating and ventilating units for distributing heat over large areas. LOWBOYS can be mounted on walls or ceilings, without using up productive or storage space. The narrow HIGH-BOYS are economically installed on floors next to walls, where they require little space. For complete information, write for free Bulletins 3137-D and 3704-A.



"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

171 MORTIMER ST. BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont. Branch offices in all Principal Cities

VENTILATING FORCED DRAFT | AIR WASHING COOLING | AIR TEMPERING HEATING | INDUCED DRAFT EXHAUSTING PRESSURE BLOWING

EASIEST TO INSTALL!

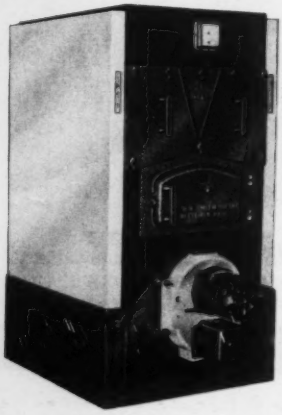
Because H. B. Smith cast iron boilers are assembled from precision-machined sections and parts, they are easily erected at the installation with a minimum of labor.

EASIEST TO CONVERT!

H. B. Smith boilers are easiest to convert to different fuels, should the one in use become in critical supply. All operate with great efficiency with solid fuel, oil or gas. In low-cost natural gas areas, H. B. Smith boiler conversions are bringing clean, trouble-free, inexpensive heat to hundreds of users.

EASIEST TO EXPAND!

When increasing the capacity of an H. B. Smith boiler to meet additional heating requirements, or when replacing it, it is not necessary to tear out a wall, part of a foundation, or both.

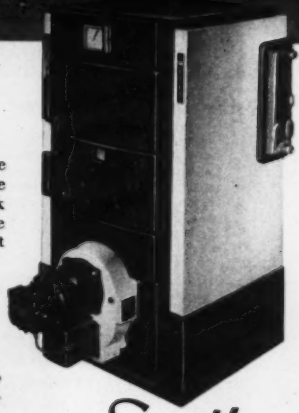


100 Boiler-Burner Unit Means More Home Sales

Compact, easy to install! Designed to give fast heat and plenty of hot water for the average home. Furnished with built-in tank type or "tankless" water heater; available with flush jacket as shown, or with jacket expanded to conceal the oil burner.

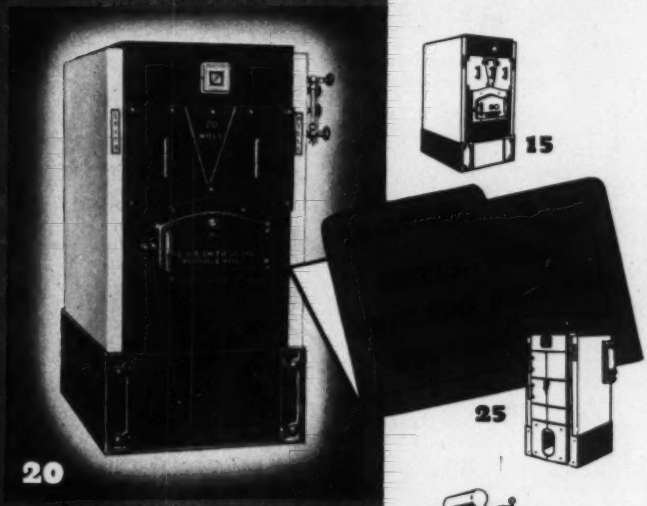
Lowest-Cost Heat and Hot Water With the 2000 Unit

Built specifically for larger homes with two or more baths and water-consuming appliances, or small commercial establishments. With over-size five-gallon-a-minute tankless water heater built in the boiler; it's the *lowest initial cost and lowest operating cost* method of supplying hot water.



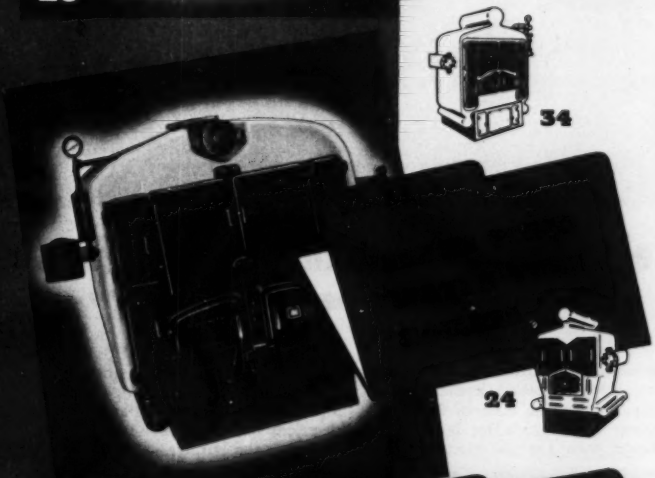
H. B. Smith

THE H. B. SMITH CO., INC.
Westfield, Mass.



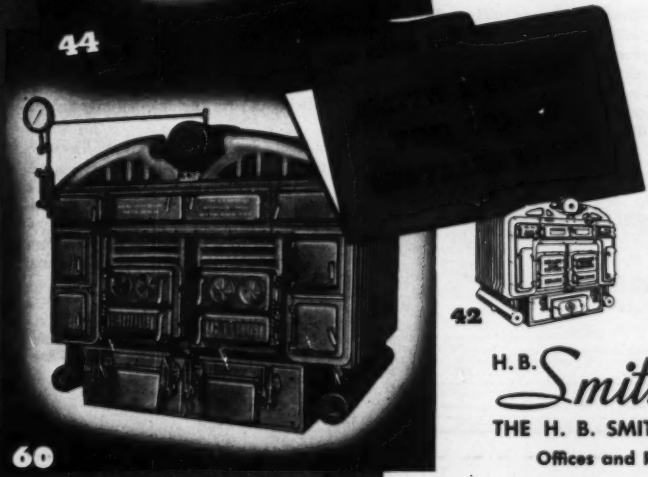
15-20-25 Smith-Mills Boilers For all Systems

Here's a complete series of modern push nipple boilers available in models for oil, gas, coal stoker or hand firing, with provision for built-in domestic water heaters and controls. Capacities of 200 sq. ft. to 2275 sq. ft. steam radiation.



24-34-44 Series Mills Water Tube Boilers

Capacities of 900 sq. ft. to 13,380 sq. ft. steam radiation. Independent header type construction; there are tens of thousands of famous Mills boilers in schools, hospitals, apartment houses, stores, and other commercial and public buildings. Models for hand and all types of automatic firing.



42 and 60 Smith Boilers For Large Installations

May be used singly, or in batteries for heating loads up to and over 100,000 sq. ft. steam radiation. Many of these large units installed in industrial plants furnish steam for process requirements as well as for heating and domestic hot water.

H. B. Smith CAST IRON BOILERS

THE H. B. SMITH CO., INC., WESTFIELD, MASS.

Offices and Representatives in Principal Cities

"We've Cleaned Out The Trouble Spots in Bunker Oil Transport Layouts!"

HOW IT WORKS

Fuel from underground storage (A) flows through pipelines (B) heated by safe 20-volt current from Transforming Energizer (C). No coking — heat spreads evenly over entire system. Thermostat (D) controls temperature at 120° F., makes system 100% automatic.

During intermittent shutdowns, fuel temperature is maintained automatically. During seasonal shutdown, fuel can solidify — Thermal Electric will melt out the pipe system.

"We've found the simplest way to eliminate the hazards and trouble-spots in steam pipe heating layouts — just eliminate the steam entirely! Now we engineer maintenance-free bunker oil transport with Thermal Electric.

"Steam or water coils in the storage tank? That bundle of trouble is gone forever! The simple Thermal Electric Tank Unit removes the fuel from *unheated* storage. Stratification is impossible since the bulk of the fuel stays solid until melted for use.

"What about the snarl of pipes and valves of recirculation? Thermal Electric has scrapped all that too, as the pipes are heated by passing low-voltage electricity through them—independent of boilers and burners.

"Getting rid of this excess baggage gets rid of the excess costs, too. With maintenance costs eliminated and operation fully automatic, the savings quickly pay for the original investment.

"What's more, Thermal Electric's positive *guarantee* lifts the responsibility for perfect performance from the engineer's shoulders. From our experience, we'd say that the best way to clean out the trouble spots from your oil burner layouts is to specify Thermal Electric *Standard* Systems!"

PAT. NO. 2,224,403 HPS-2

Thermal Electric Fluid Systems INC.

Fluid Systems Inc., 1881 Dixwell Ave., New Haven 14, Conn.

Please send me "The Common Sense of Heavy Fuel Transport" plus Customer List of hundreds of satisfied users.

*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

Thermal Electric and Fluid Systems, Inc. are trade marks registered in U.S. Patent Office

"Tough Fluids Flow Easily For Us with Thermal Electric Pipe Transport!"

"Our first step in engineering industrial fluid transport layouts is to specify Thermal Electric. This method of passing electricity through the same pipe that carries the fluid meets any requirements.

"Temperature is no problem. Thermal Electric will safely move fluids varying from luke-warm chocolate to liquid asphalt at 450°F. Precise automatic controls hold it within 2°F. of the design temperature.

"By using systems in tandem, we cover any distance. This zone-control also nails down the problem of different ambient temperatures. Fluids flow from cold outdoors to warm indoors with no temperature change.

"We design single discharge lines with no return loops and effect tremendous savings in critical materials and capital investment. With all-electric operation cutting maintenance practically to zero, the savings often pay for the original investment in less than a year!

"If pipe transport of heated fluids is among your projects, it would pay you to get the whole story of Thermal Electric Industrial Systems."

Fluid Systems, Inc. are speciality engineers in the handling of industrial viscous fluids. We are available as special aides to consulting or staff engineers in designing transport systems for any fluid.

YEARS OF PERFORMANCE

American Hard Rubber Co.
Asphalt: 182' at 450°F.

Duff Baking Mix Division
American Home Foods, Inc.
Molasses: 970' at 140°F.

Congoleum-Nairn, Inc.
Emulsion Paint: 337' at 100°F.

General Mills, Inc.
Corn Syrup: 223' at 110°F.

Individual Drinking Cup Co.
Paraffin: 1,489' at 170°F.

Monsanto Chemical Company
Water: 742' at 70°F.

HPI-2

PAT. NO. 2,224,403

Thermal Electric

Fluid Systems Inc.

Fluid Systems Inc., 1881 Dixwell Ave., New Haven 14, Conn.

Please send me "Simplified Industrial Fluid Transport Cuts Costs" plus customer list.

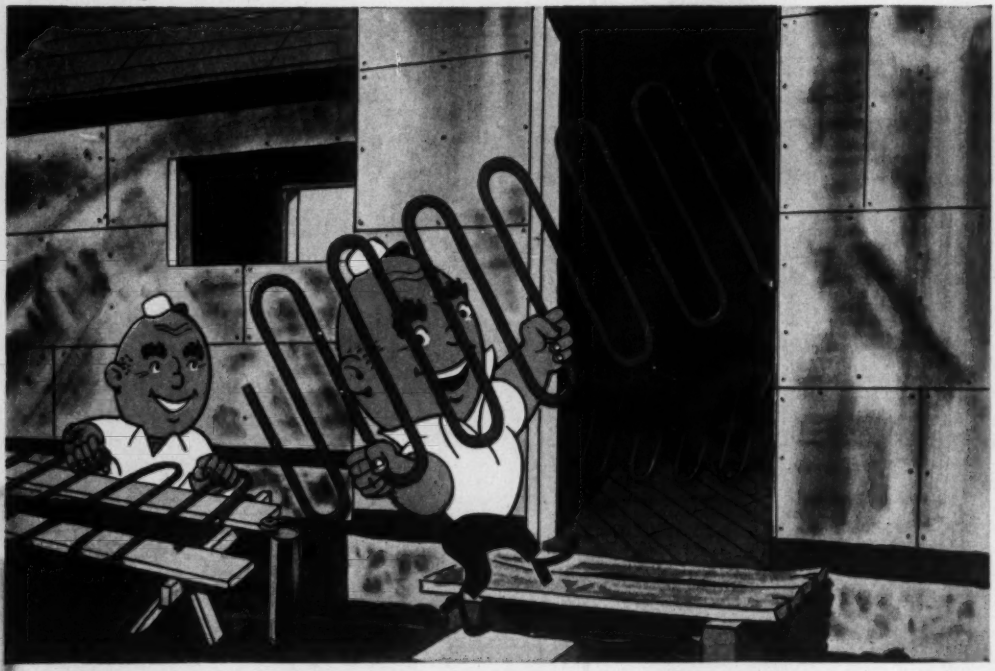
*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

THERMAL ELECTRIC and FLUID SYSTEMS, INC. are trade marks registered in the U. S. Pat. Off.



Bundyweld . . . right in your homes for better radiant heating

Unique construction, unique advantages—that's why!

Bundyweld is the only tubing double-walled from a single strip. It's extra-strong. Copper-brazed through 360° of wall contact, it's leakproof. It's double-walled, yet thinner-walled . . . *right* for faster-heating, more effective systems in your houses.

It's *right* for easier handling, too, on your building site. From its arrival in twenty-foot lengths (one end expanded when specified) to final installation in your ceilings, walls, or floors, tough Bundyweld rides over jolts, knocks, and jars. On a simple fixture, one man easily bends ductile Bundyweld to short radii, with no danger of structural collapse. Formed grids are easily joined, joined grids quickly positioned.

Briefly, when Bundyweld goes to work on your job, time, labor, materials savings, and better all 'round radiant heating go with it. Check Bundyweld today. For details, see *Sweet's Architectural File.* Or write: ***Bundy Tubing Company, Detroit 14, Michigan.***

Bundyweld® Tubing

DOUBLE-WALLED FROM A SINGLE STRIP

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of basic metal, coated with a bonding metal. Then it's . . .

continuously rolled twice around laterally into a tube of uniform thickness, and

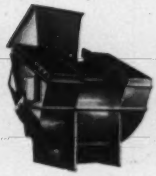
passed through a furnace. Bonding metal fuses with basic metal, presto—

Bundyweld . . . double-walled and brazed through 360° of wall contact.

NOTE the exclusive patented Bundyweld beveled edge, which affords a smoother joint, absence of bead and less chance for any leakage.

American Blower—a time-honored name in air handling

Venturafin Unit Heaters



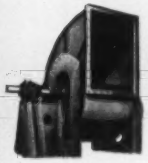
Mechanical Draft Fans

Utility Sets

Ventura Ventilating Fans

Dust Collectors

Air Washers



Industrial Fans

Heating and Cooling Coils

Air Conditioning Equipment

Look before you buy and you'll buy American Blower Air Handling Products. There's a big difference in quality, design, quietness, operating costs and efficiency. The superiority of American Blower products has been proved in test after test by buyers.

In Indianapolis, as in other cities, American Blower Air Handling Products serve commerce, industry and public utilities. For air handling data in the Indianapolis area, call American Blower—Riley 4521. Elsewhere, consult your phone book.

Product of the month

American Blower Industrial Unit Heater. 7 Sizes. Capacities from 1,900 to 28,000 cfm and from 79,000 to 1,630,000 Btu/hr.

Ideal for heating large areas

For heating large areas, such as factories, foundries, garages, warehouses, laundries, and machine shops, American Blower Industrial Type Unit Heaters are unsurpassed.

They're available in seven sizes for wall, horizontal, inverted or floor installation. Coils are offered in a wide range of capacities, and with the option of three coil designs—steam, hot water or freeze-resistant. Universal Cowls, adjustable on the job, direct air and heat to desired areas.

If you have a heating problem, consult your local American Blower Branch Office. They'll be glad to furnish you with further information about Industrial Heaters and the wide range of other reliable American Blower products for both heating and ventilating.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN
CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of American Radiator & Standard Sanitary corporation

YOUR BEST BUY AMERICAN BLOWER AIR HANDLING EQUIPMENT

Serving home and industry

AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS • DETROIT LUBRICATOR • KEWANEE BOILERS • ROSS HEATER • TONAWANDA IRON

A MESSAGE TO AMERICAN INDUSTRY

"This is more than a shortage . . . this is an emergency.

Every pound of your scrap is needed, NOW!"

"THE STEEL INDUSTRY is currently operating at more than 100% of rated capacity—turning out well over 2 million tons of steel per week. This record high production—every ton of which is in urgent demand—cannot be kept up unless we get more scrap from every potential source. For without your scrap we cannot produce enough steel. Today, every ton of steel turned out requires a half a ton of scrap for its production. That's why scrap—more scrap—is so urgently needed, and needed right away.

"The fact we have to face today is that steel mills are operating on a hand-to-mouth basis as far as scrap is concerned. Some mills are working on only a two-day supply of scrap. We already have had to shut down steel-making furnaces for lack of scrap.

"That's why we are asking you to strain every effort to get more scrap out of your plants and yards and on its way to the mills . . . to search out the scrap that doesn't come to market in normal times. You'll find this "dormant" scrap in obsolete equipment, tools and machinery that you haven't used for years . . . overlooked in your storage sheds . . . or rusting away in a junk pile in some forgotten corner. It's there. Turn it in at once—*so we can turn out the steel you need.* We can't do it without your help."

President, United States Steel Corporation

USS

UNITED STATES STEEL

ULTRALITE

faced insulations *save an entire step* in duct applications!

It's costly to apply insulation to ducts, and then cover with a facing — you can do both jobs in one easy step with ULTRALITE faced insulations!

THE ULTRALITE FAMILY OF FACINGS

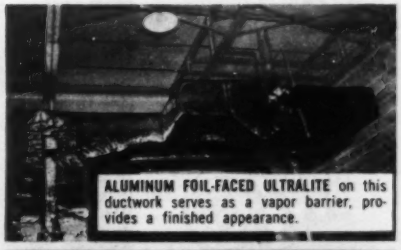
Sisalkraft • Sisalation
Latex-treated Muslin
Aluminum Foil • Plastic Film
Asbestos Paper
Asbestos Paper and Aluminum Foil Laminate

ULTRALITE is the long glass fiber insulation that is available plain, or with your choice of a number of different facings *already adhered to the insulation!* Whether you need facings for the sake of appearance, or as a vapor barrier for summer/winter air conditioning ducts, you'll find one of the ULTRALITE facings made for your particular job.

Insulation applicators are using more than 1,000,000 feet of ULTRALITE faced insulations each month. Maybe you, too, could be doing a faster, neater job and pocketing more profit by using these step-saving insulations. It's worth looking into — write today for full details!

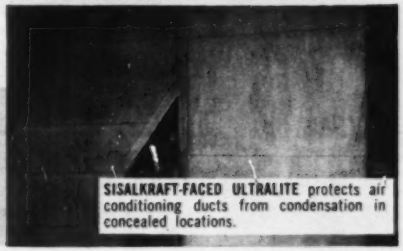
Don't overlook the advantages of installing a few feet of Ultralite DUCT LINER in supply ducts and plenums. This superb acoustical insulation dampens fan noise, lets heating and air conditioning systems operate at peak capacity without disturbing anyone.

TYPICAL ULTRALITE INSTALLATIONS



ALUMINUM FOIL-FACED ULTRALITE on this ductwork serves as a vapor barrier, provides a finished appearance.

PLAIN ULTRALITE, used here on warm air ducts that require no vapor barrier facing.



SISALKRAFT-FACED ULTRALITE protects air conditioning ducts from condensation in concealed locations.

GUSTIN-BACON MFG. CO.

1412 W. 12TH ST., KANSAS CITY, MO.

New York Chicago Philadelphia San Francisco Los Angeles
Houston Tulsa Fort Worth

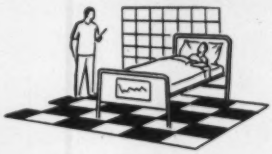
Ultralite Distributors in 67 major cities carry complete stocks for prompt delivery.

New Servel Water application and

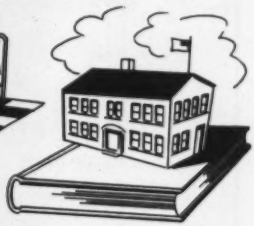
THE SERVEL WATER CHILLER—AN ECONOMICAL SOURCE OF CHILLED WATER OR AIR CONDITIONING

OFFICE BUILDINGS

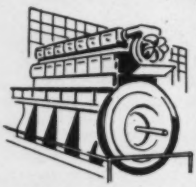
LARGE STORES



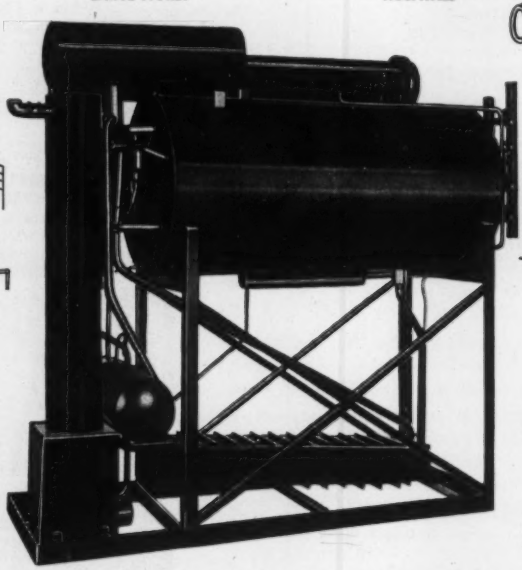
HOSPITALS



SCHOOLS

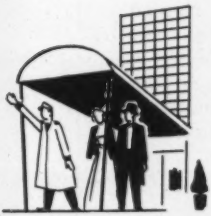


SPECIAL PRE-COOLING



FACTORIES

INDUSTRIAL PROCESSES



HOTELS

DESCRIPTION: Rated capacity under standard ASRE conditions—25 tons. Hermetically sealed absorption refrigeration system. Refrigerant, water. Absorbent, lithium bromide. Source of energy, steam. Refrigeration unit operates under a vacuum, but the chilled-water circuit operates under ordinary pump pressure.

SERVEL STEAM-OPERATED AIR CONDITIONERS

Self-Contained unit. 5 tons of refrigeration. Heating optional.

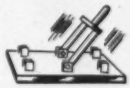
***All-Year* Air Conditioner. In 3-ton and 5-ton sizes. Cooling *and* heating.**

For single or multiple installations.

Chiller offers many operating economies

Uses steam from any source, even *waste* steam!

Electric-power needs are nominal



Light enough to install on any floor

Supplies chilled water or air conditioning

You'll find it well worth while to consider the new Servel 25-Ton Water Chiller as a source of chilled water for industrial processing, or air conditioning. It's so light, quiet, and free from vibration you can install it on any floor, even the roof. You can operate it on steam from any source, at any pressure, produced with any fuel. If waste steam or waste heat is available, you can operate on it, and save most of the normal costs of fuel. And since electric-power requirements are negligible, you can usually connect it to existing electric systems.

Along with these installation economies, you get the operating benefits of Servel's famous no-moving-parts cooling system. This means dependable operation, long life, and low maintenance. You get unusually close control of temperatures, too, because you can modulate capacity as much as 50%.

Send today for full information. No obligation. And if you care to include details of your cooling or air-conditioning problem, we'll be glad to have our application engineers make suggestions.

WHY SERVEL IS YOUR BEST AIR-CONDITIONING BUY

• No moving parts in cooling system to wear out • Low maintenance costs • Long life • Hermetically sealed • Complete safety of operation • Chilled-water circuit operates under normal pump pressure

SEND COUPON FOR MORE INFORMATION

Servel

AIR CONDITIONERS

FOR INDUSTRY • FOR HOME • FOR BUSINESS

Servel, Inc.
Department R-28 Evansville 20, Indiana
Gentlemen:

Please send me more information on the following:

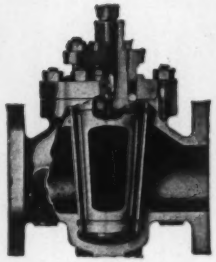
Servel 25-Ton Water Chiller_____
Servel Self-Contained Air Conditioner_____
Servel 3- and 5-Ton *All-Year* Air Conditioners_____

*Name*_____
*Firm*_____
*Address*_____

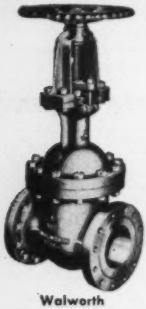
IF YOUR JOB CAN BE DONE BETTER WITH AIR CONDITIONING OR COOLING, IT CAN BE DONE BEST WITH SERVEL

• VALVES

• PIPE FITTINGS

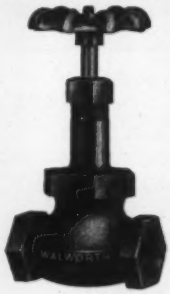


Walworth
Lubricated Plug Valve



Walworth
Steel Gate Valve

Walworth
Iron Body Gate Valve



Walworth
"500 Brinell" Bronze Globe Valve

Walworth
Iron Body Saddle Gate Valve

Walworth
Cast Steel Flanged Fittings

Walworth manufactures a *complete line* of valves and pipe fittings: all made to the highest standards of quality, both as to dimensional accuracy and metallurgical properties. In design, construction, and performance, Walworth products reflect more than a century of experience in the manufacture of quality valves and fittings.

Your Walworth distributor will give you full information on the *complete line* of Walworth steel, iron, and bronze, and special alloy valves and pipe fittings; also Walworth Lubricated Plug Valves, and Walseal* valves, fittings and flanges. Ask for this information today.

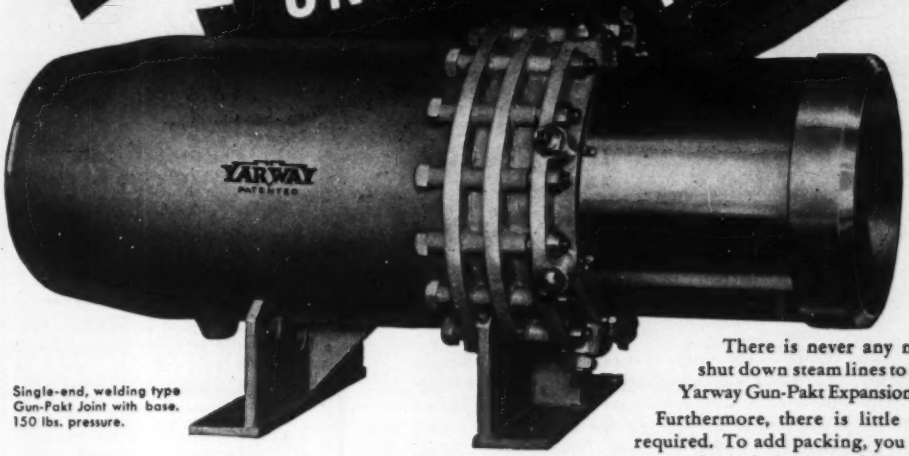
*Patented—Reg. U. S. Pat. Off.

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

THIS EXPANSION JOINT IS SERVICED UNDER FULL STEAM PRESSURE



Single-end, welding type Gun-Pakt Joint with base. 150 lbs. pressure.

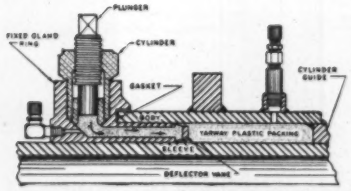
There is never any need to shut down steam lines to service Yarway Gun-Pakt Expansion Joints.

Furthermore, there is little service required. To add packing, you simply insert a plug of plastic packing, turn a wrench, and the job's done! Special Alemite fittings provide for proper lubrication.

Maintenance costs are trifling. One large user reports 65 cents per year per joint. Others claim less than that.

Gun-Pakt Joints are available with single or double-ends, welding or flanged types, in sizes from 2″ to 30″, with traverses from 4″ to 24″, and for pressures to 400 psi.

For the full Gun-Pakt story, write for Yarway Bulletin EJ-1912.



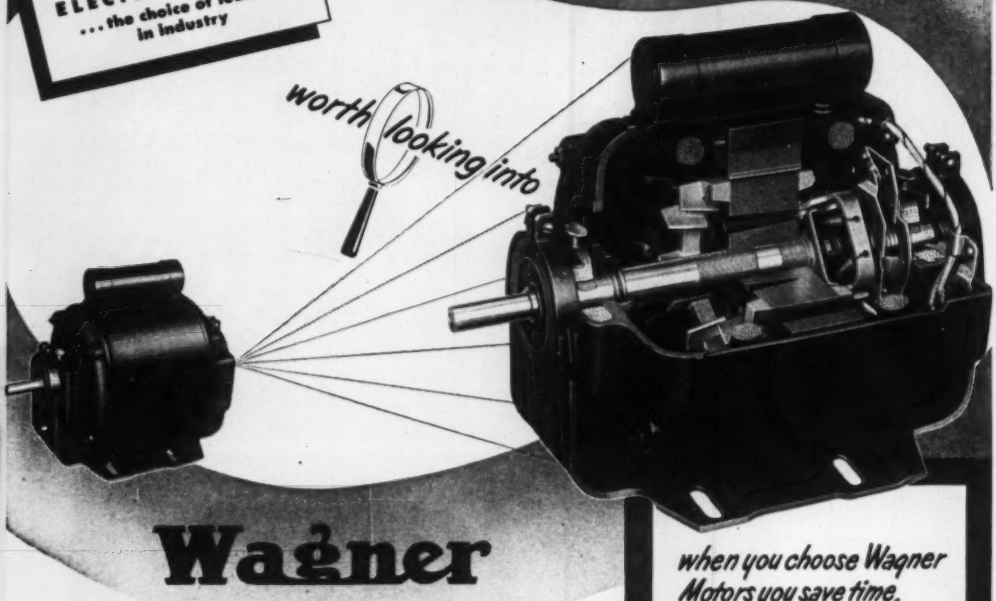
Close-up of cross-section showing detail of Gun-Pakt feature.

YARNALL-WARING COMPANY
107 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY **GUN-PAKT EXPANSION JOINT**

Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

it pays to be particular about your choice of motors



Wagner
CAPACITOR-START MOTORS

are exceptionally well-adapted to applications with fairly heavy starting loads

The choice of the motor that powers your product is all important. Uniform performance, troublefree long-life operation, a well-known name, and the ability of the manufacturer to provide fast service and repair parts on a nationwide scale, are all factors that add up to satisfied customers for you.

Wagner capacitor-start motors are worth looking into for general purpose applications requiring high starting torque. They are available with sleeve or ball bearings, rigid or resilient bases or a machined end plate for flange mounting. Bulletin MU-185 gives full details—write for your copy.

WAGNER CAPACITOR-START MOTORS...*built in ratings from ½ through 3 hp.*

when you choose Wagner Motors you save time, money, worry because:

1. Improved engineering features assure long life and efficient operation.
2. Wagner Motors are available in a wide range of types and sizes for every application.
3. Wagner Motors are backed by a liberal warranty.
4. They are available from Wagner Branches in all principal cities.
5. More than 650 Wagner Authorized Service Stations and Parts Distributors *plus* 25 Wagner-owned Service Branches provide on-the-spot service, replacement motors, or genuine repair parts.

®Wagner Electric Corporation
1891 WE 1951

WAGNER ELECTRIC CORPORATION
6370 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

BRANCHES IN 31 PRINCIPAL CITIES

MU1-15

BRUNNER SINCE 1906 **REFRIGERATION** helps you serve better

There are just two steps to closing more business

THE FIRST STEP IS— *use this coupon*

Just fill it in and mail it

We will know this is your request for a Brunner factory representative to stop in and go over the reasons why Brunner dealers find it easier to close business.

Name

Company

Address

City and State

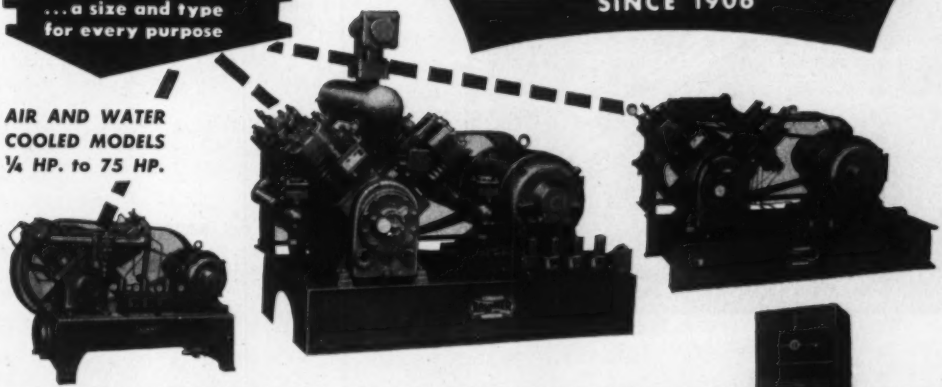
With all the facts fresh in mind you will recognize the second step—recommend and install Brunner's from now on. With 69 models comprising a complete range of commercial capacities and types, a dependable source of supply and a known product with ready acceptance by your customers, selling obstacles are removed and you are on the way to bigger business. We will be looking for the coupon.

BRUNNER MANUFACTURING COMPANY
Utica 1, New York, U. S. A.

REFRIGERATION CONDENSING UNITS
...a size and type for every purpose

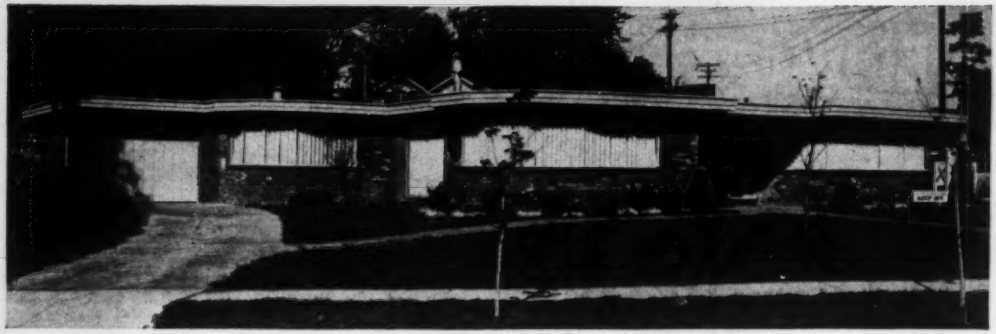
BRUNNER SINCE 1906

AIR AND WATER COOLED MODELS 1/4 HP. to 75 HP.

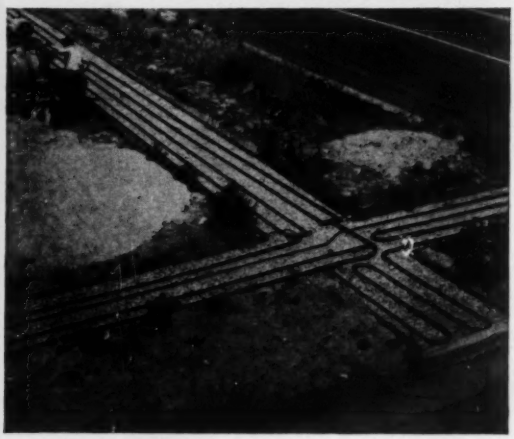


BRUNNER SINCE 1906

AIR CONDITIONING
Self Contained Units in 4 sizes: 3-5-7½ and 10 HP.
Remote Installation Types from 3 to 75 HP.



A mile of pipe for a mile-high house!



● "Sun-Age Homes"* are well-known in mile-high Denver. Windows are big (over 40% of wall area). Plenty of storage space is built-in. The functional design makes for easy living. And—

Radiant heating is an important selling feature of every Sun-Age Home. The interior, plus the driveway and sidewalk snow-melting system are heated with 6000 feet of NATIONAL *Steel* Pipe—the standard pipe for hot-water heating for over 60 years.

In the first 10 days that this sample home was displayed, over 8,000 adults visited it. *90%* of these people requested more information on radiant heating and snow melting. This intense public interest in the comfort and convenience of these systems has helped to sell a lot of Sun-Age Homes—just as it's helping to sell homes in every part of the country.

NATIONAL *Steel* Pipe is just the thing for an installation like this. It's economical. It's easy to weld. It's strong. Yet it's ductile enough to allow easy bending.

If you are planning a future radiant heating installation for a home, garage, store, church, terminal, factory, warehouse or plant, remember that NATIONAL—the world's largest selling pipe—has all the qualities that make for successful application.

**Trade Mark, Reg.*

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
COLUMBIA STEEL COMPANY, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

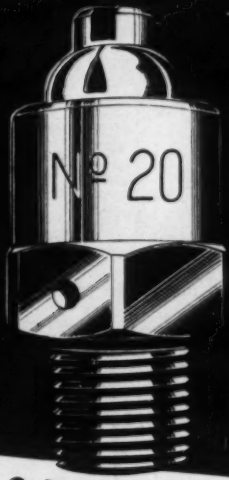
USS

NATIONAL Steel PIPE

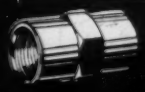
UNITED STATES STEEL

Same Goal

No. 20



WINNING PERFORMANCE FOR USERS



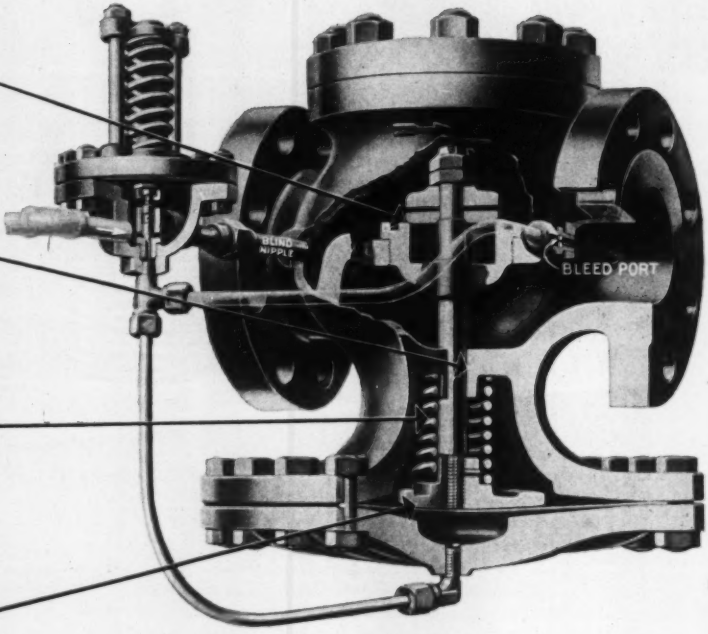
WHY Spence Regulators Outlast The Field

SECO METAL SEATS AND DISCS — Durable SECO Metal resists wiredrawing. More than *twenty years of experience* in thousands of installations has failed to produce a single case where SECO Metal has been cut by steam.

PACKLESS CONSTRUCTION — All Spence main valves and most pilots are built without stuffing boxes. This minimizes friction . . . eliminates much time-consuming maintenance.

SPRING OUT OF PATH OF STEAM — The spring in the Spence Regulator is out of the path of the steam or other fluid flowing through the valve. It operates at low unit stress for exceptionally long life.

LARGE BALANCED DIAPHRAGM—Spence metal diaphragms, under usual conditions, never require replacement. Spence Regulators have few moving parts and those few are ruggedly constructed and seldom require attention.



Spence Type EQ back pressure regulator — operation of main valve is controlled by a sensitive pilot to regulate the initial pressure. Same pilot is used with all sizes of main valves.

The features shown above explain why you profit on every important count with Spence Pressure and Temperature Regulators.

Learn more about these and many other advantages of Spence Regulators by sending for Bulletin 350.

DURABILITY — Spence Regulators perform dependably year after year.

ACCURACY — You can be sure of accurate control for the life of the regulator.

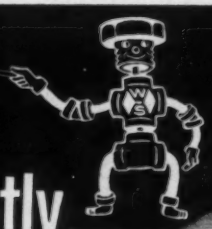
MAINTENANCE — You don't need expensive repairs or special maintenance. That means less down-time, less time and money wasted on replacement of parts.

SR-110

SPENCE ENGINEERING COMPANY, INC.
WALDEN, NEW YORK

Spence

Where pipes meet permanently...

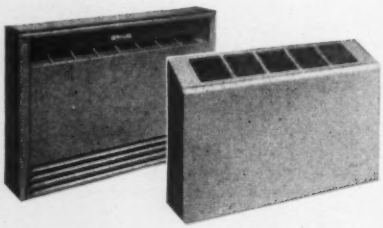


WATSON-STILLMAN

DISTRIBUTOR PRODUCTS DIVISION **WATSON-STILLMAN** ESTABLISHED 1848 • ROSELLE, NEW JERSEY

(Designers and Manufacturers of Forged Steel Fittings, Valves, Wire Rope Sheaves, Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment

SPECIFY MODINE CONVECTORS FOR EVEN, HEALTHFUL HEATING



Choose from two enclosure types. Type F for either recessed or free-standing installation. Type S designed for wall placement.

Modines give many years of economical, trouble-free service

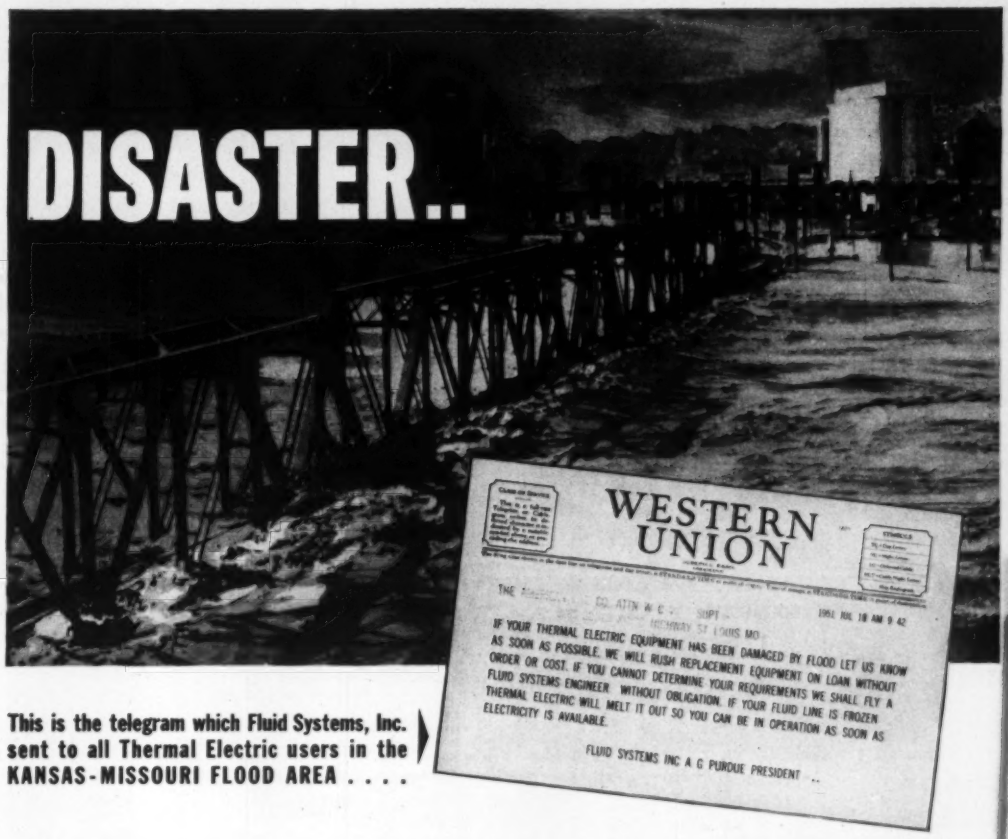
Modine Convectors maintain even, healthful floor-to-ceiling temperatures — *in any weather*. Original cost is surprisingly low, and Modines require a minimum of servicing. They are ruggedly constructed to withstand schoolroom hazards — can't burn hands or clothing.

Modines can be supplied with standard heating units for hot water or 2-pipe steam — or with the new Quiet-Seal heating unit for 1-pipe steam.

Modine
CONVECTORS

For the full story, call your Modine representative listed in the classified section of your phone book. Or write direct. Modine Mfg. Co., 1509 DeKoven Ave., Racine, Wis.

R-1104


DISASTER..
WESTERN UNION
IF YOUR THERMAL ELECTRIC EQUIPMENT HAS BEEN DAMAGED BY FLOOD LET US KNOW AS SOON AS POSSIBLE. WE WILL RUSH REPLACEMENT EQUIPMENT ON LOAN WITHOUT ORDER OR COST. IF YOU CANNOT DETERMINE YOUR REQUIREMENTS WE SHALL FLY A FLUID SYSTEMS ENGINEER WITHOUT OBLIGATION. IF YOUR FLUID LINE IS FROZEN THERMAL ELECTRIC WILL MELT IT OUT SO YOU CAN BE IN OPERATION AS SOON AS ELECTRICITY IS AVAILABLE.
FLUID SYSTEMS INC A G PURDUE PRESIDENT

This is the telegram which Fluid Systems, Inc. sent to all Thermal Electric users in the KANSAS-MISSOURI FLOOD AREA . . . .

Just picture this: As flood waters began to rise, Thermal Electric users did not have to maintain steam in the face of impossible difficulties to prevent freeze-up of their wax, asphalt or other fluid lines. They did not have to remember to drain them, with a thousand other simultaneous problems demanding their attention.

Afterward, they did not have to disassemble or re-erect their fluid transport. They just hooked another Thermal Electric Transforming Energizer to the pipe, and production proceeded while Fluid Systems Engineers dried out the flood-soaked unit for reinstallation.

Where a Thermal Electric Standard System is part of the oil burning layout, steam becomes available immediately for drying out the premises and for essential services. Thermal Electric melts the bunker fuel in the pipes and in storage. If old fashioned steam systems had been used, waterlogged remote pump-sets could not have maintained constant circulation and no steam could have been available for days to heat the fuel. Thermal Electric provides immediate operation as soon as the flood recedes.

Thermal Electric's flexible equipment design permits us to furnish disaster replacements immediately from stock.

Thermal Electric has helped in many disasters. Thermal Electric was used in restoring service to Southern New England Telephone Company, New England Telephone and Telegraph Company, United Illuminating Company, and many companies along the Atlantic Seaboard after two devastating hurricanes.

In the Kansas-Missouri flood area, Thermal Electric speeded the return of service for—

Owens-Corning Fiberglas Corp.
915′ of 375°F. asphalt transfer

American Can Company
140′ of 425°F. asphalt transfer

Blanke-Baer Extract and Preserving Company

Eden Seminary

Marillac Seminary

Stephens College

Enterprise Cleaning Company

Sears-Roebuck and Company

Fluid System's engineers are a service team. No cost or effort is spared to maintain continuous and dependable performance. Direct contact with home office personnel insures service without delay at all times.

PAT. NO. 2,224,402

Thermal Electric

FLUID SYSTEMS, INC., 1881 DIXWELL AVE., NEW HAVEN 14, CONN.

Fluid Systems INC.

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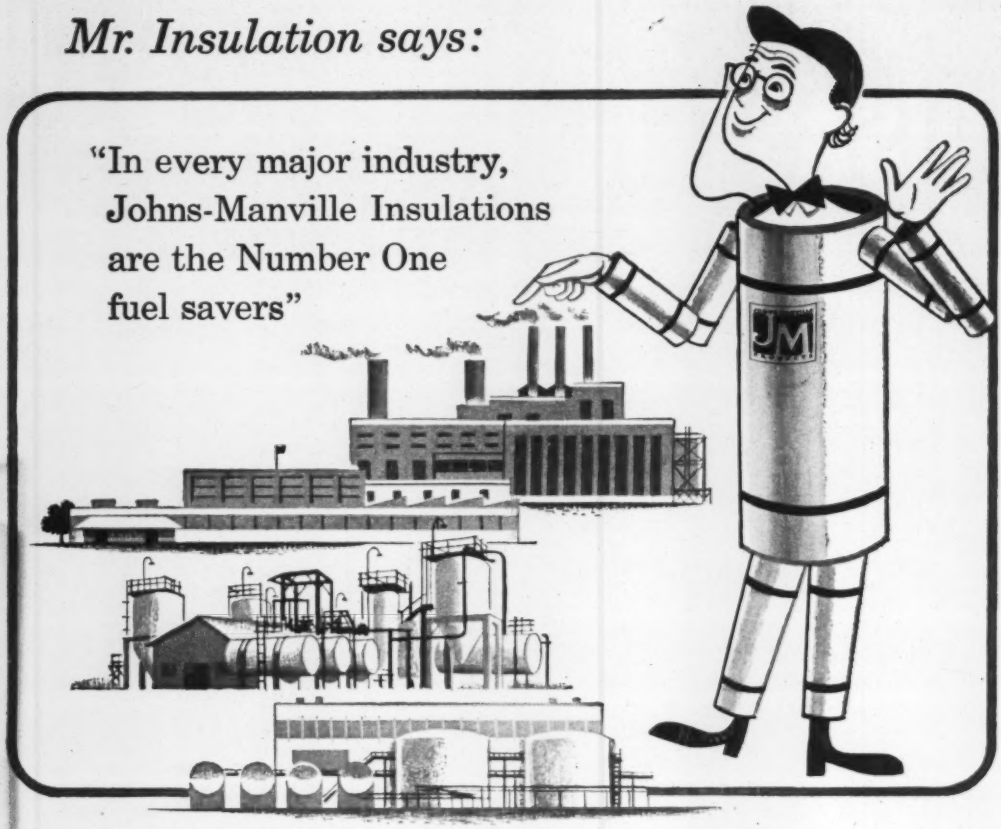
Mr. Insulation says:



IN PLANTS with stacks or stills, tanks or towers, the story is the same—"Insulation by Johns-Manville" means the maximum return on your investment. There are two good reasons for this:

1. YOU GET THE RIGHT *MATERIALS*—From asbestos and other selected raw materials, Johns-Manville manufactures a wide range of industrial insulations for service from 400F below zero to 3000F above. If you need engineering advice in determining exactly the right one for your job, you can get experienced and authoritative assistance from your local Johns-Manville insulation engineer.

2. YOU GET THE RIGHT *APPLICATION*—Even correctly selected insulation needs proper application to permit it to serve at peak efficiency through the years. Here you can always count on J-M Insulation Contractors and their highly skilled mechanics. These organizations are trained in Johns-Manville application methods, and have generations of insulation experience behind them.

Why not get the complete picture? Call on insulation headquarters when your next job is in the planning stage. Just write Johns-Manville, Box 290, New York 16, N. Y.

Johns-Manville *first in* **INSULATIONS**

NEW

FREE UNISTRUT CONSTRUCTION CATALOG!

78 Illustrated Pages on How to Frame, Hang, Support and Mount many kinds of Mechanical and Electrical Equipment with Unistrut All-Purpose Metal Framing

Simple and Complete . . . Easy to Use . . . Loaded with Pictures, Data and Complete Information . . . Shows Details of Product and Applications . . . How to Order

Get Acquainted with UNISTRUT Today! Write for Your Free 78-page Construction Catalog 700

With UNISTRUT you can build all types of framing, mounts, shelving, racks, tables and benches—conduit, cable, pipe and tubing hangers and supports—fluorescent fixture supports, and many other structures with just a hacksaw and a wrench.

UNISTRUT is metal channel with a continuous slot. You simply insert the UNISTRUT spring-held clamping nut into the channel at approximate point where attachment of another framing fitting is desired, slide to exact location and bolt to UNISTRUT fitting.

UNISTRUT includes concrete inserts, roller pipe supports, brackets, clamps and many other standard parts which in combination provide the world's most flexible system of support or suspension. UNISTRUT does the complete job—you need no other parts or materials.

UNISTRUT is trim framework—provides great strength without bulk. It's easy to work with, lasts indefinitely, and the finished structure assures neat and orderly appearance.

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The World's Most Flexible All-Purpose Metal Framing

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☐ Catalog 700 ☐ 24" x 36" Wall Chart
☐ Free Unistrut Sample

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Company_____

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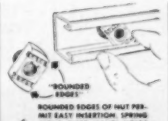
City_____ Zone____ State_____

Only **UNISTRUT**
GIVES YOU THIS FAST CLAMPING, LOCKING ACTION AND THIS COMPLETE ADJUSTABILITY AND RE-USABILITY

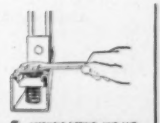
1 WEDGE SHAPED INTURNED EDGES TO TAKE SERRATED GROOVES OF UNISTRUT NUT.

2 SERRATED GROOVES "BITE INTO" INTURNED EDGES OF CHANNEL FOR POSITIVE CLAMPING ACTION.

3 INSERT SPRING NUT ANYWHERE ALONG CONTINUOUS SLOT OF CHANNEL.



4 ROUNDED EDGES OF NUT PERMIT EASY INSERTION. SPRING (YOUR THIRD HAND) HOLDS NUT SNUGLY IN PLACE FOR BOLTING.



5 ASSEMBLE FITTING, NUT AND BOLT—A TURN OF THE WRENCH, IT'S DONE.

UNISTRUT PRODUCTS COMPANY, 1013 WEST WASHINGTON BLVD., CHICAGO 7, ILLINOIS

HENRY

REALLY GIVES YOU SOMETHING EXTRA!

1 **RELIEF VALVES** diaphragm construction, positive controlled cushion reseating with relief capacity that meets latest code requirements.

2 **WING CAP VALVES** greater flow, bolted bonnet and self-aligning stem disc.

3 **PACKLESS VALVES** still the only Balanced-Action valve on the market—no extra cost.

4 **DRIERS** forged brass end caps with integral fittings, natural finish, Abso-Dry pressure sealed, dispersion tube and extra capacity.

5 **AMMONIA VALVES** compact and strong, self-aligning stem disc.

6 **STRAINERS** forged brass end caps with integral fittings, reinforced screen, large filtering area, distortion-proof clean-out flange.

HENRY VALVE CO
CONTROLLING FLOW

Sold by Leading Wholesalers

HENRY VALVE CO.

Valves • Driers • Strainers • Control Devices and Accessories for Refrigeration, Air Conditioning and Industrial Applications

MELROSE PARK, ILL. (CHICAGO SUBURB)
CABLE: HEVALCO, MELROSE PARK, ILLINOIS

Make DOREX AIR RECOVERY part of your air conditioning or heating installation

Every ventilation system must supply a certain amount of fresh air to maintain satisfactory air quality within the conditioned space. But air supplied from the outside must be heated or cooled, depending upon the season. Dorex Air Recovery reduces the amount of outside air required for ventilation . . . thus, substantially less heating and cooling equipment is needed, and critical materials are saved.

The thrifty Dorex C Cell is a simple device that "manufactures" *fresh* air from *used* air by passing it through activated carbon – reducing, by as much as two-thirds, the amount of outside air that has to be taken into the system.

In dollar savings, this means that every $100 invested in Dorex Air Recovery should save some $400 on original heating and cooling equipment . . . and, in operation, every $1 spent for Dorex maintenance should return a $4 saving in running costs. These are averages based on 20 years' experience and over 7,000 Dorex installations.

Let us show you in detail the dollars-and-sense value – to you and your customers – of Dorex Air Recovery. Mail the coupon today.

TRADE MARK "DOREX" REG. U. S. PAT. OFF.

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Air Recovery

W. B. CONNOR ENGINEERING CORP.
Danbury, Connecticut
Air Diffusion • Air Purification • Air Recovery
In Canada: Douglas Engineering Co., Ltd.,
190 Murray Street, Montreal 3, P. Q.

W. B. CONNOR ENGINEERING CORP.
Dept. A-8, Danbury, Connecticut

Please send me, without obligation, full information on Dorex Air Recovery.

Name .....
Position .....
Company .....
Street .....
City ..... Zone ..... State .....

THE CHICAGO PUMP IS A BETTER PUMP

Figure V 9500—Type AVC Condensation Pump and Receiver. Receiver serves as base. Low inlet — suitable for floor mounting or shallow pit. No foundation bolts necessary. Ask for Bulletin 245.

. . . For Every Heating Purpose

Figure L 9700—Type CLL1 Vertical Condensation Pump. Extra heavy duty unit. Specifically designed for low return service and underground installations. Ask for Bulletin 255.

Get the pump that is specifically designed for the particular job. For below floor returns, for low vacuum systems, for small capacity high pressure requirements, for any standard heating system or any unusual condition there is a Chicago Heating Pump that will do the job better.

All ratings and receiver capacities meet or exceed ASHVE standards.

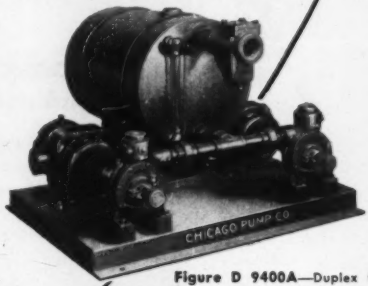
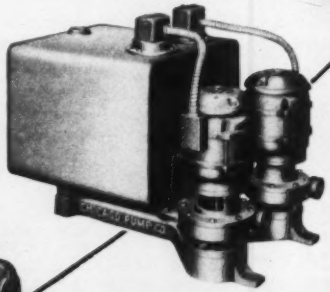


Figure D 9400A—Duplex FC Condensation Unit. For duty up to 50,000 EDR and discharge pressures up to 150 lbs. Ask for Bulletin 260.

Figure D 9900—Duplex Condo-Vac Return Line Vacuum and Boiler Feed Pump for vacuum heating systems. Pressures up to 40 lbs., and from 2500 to 150,000 EDR. Ask for Bulletin 270.



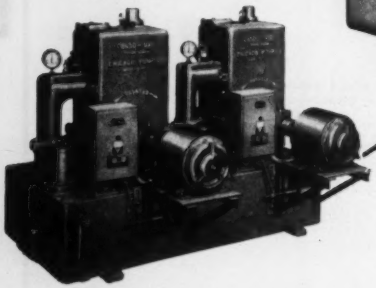


Figure D 9200—Sure Return Condensation Pump and Receiver. For systems up to 75,000 EDR and for low and medium pressures. Available in either single or duplex units. Ask for Bulletin 250.

CHICAGO PUMP COMPANY

BUILDING and INDUSTRIAL DIVISION

2300 WOLFRAM STREET — **CHICAGO 18, ILLINOIS**

Condo-Vac, Sure Return, AVC, LVC, Fire, House & Circulating Pumps Pneumatic & Tankless Water Systems

Flush-Kleen Sewage Ejectors Little Giant & Non-Clog Bilge Pumps Pumps for every industrial use.

Summer is the time to plan

RADIANT HEATING AND SNOW MELTING INSTALLATIONS

WITH SPANG CW STEEL PIPE

Now is the time to plan to install Radiant Heating and Snow Melting systems. Radiant Heating is the trouble-free, closed wet-heating system to use in modern offices, factories, and homes; Spang CW is the trouble-free Steel Pipe to specify. Your men will find it easy to bend, easy to cut, thread and weld.

Up-to-date airports, hotels, clubs, office buildings and homes banish slippery and snow-caked areas for good with heated Snow Melting installations. Make these Snow Melting installations with Spang CW Steel Pipe for ease of fabrication, and assured years of maintenance-free service.

Spang CW is used by industry for all types of services. Leading distributors carry it, plus the fittings you need. For uniform quality and dependability in piping systems, ask for Spang CW Steel Pipe by name.

SPANG-CHALFANT
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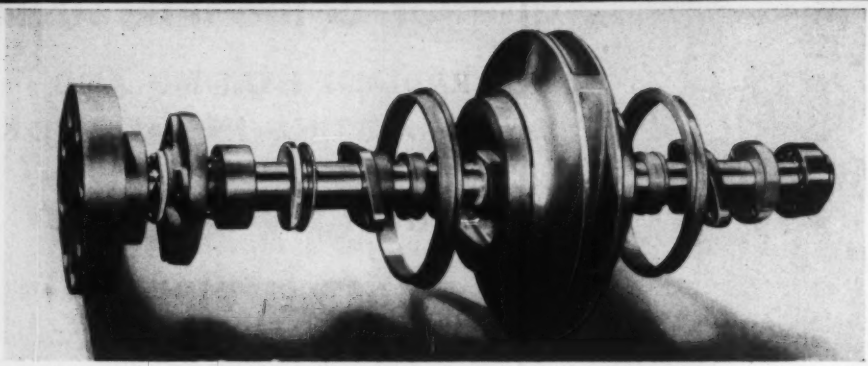
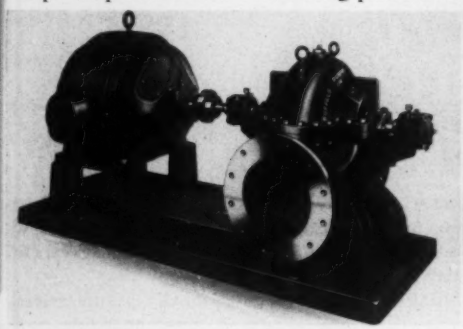
"INSIDE STORY" on "Buffalo" PUMPING EFFICIENCY!

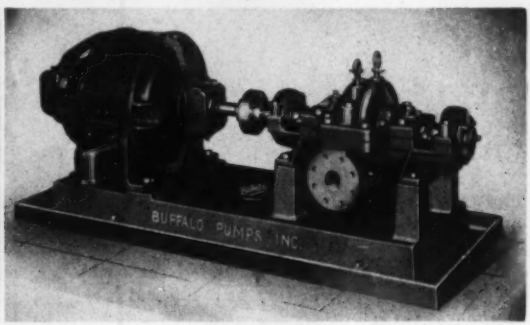


ROTOR AND SHAFT ASSEMBLY FROM A TYPE "SL" PUMP

Here is strength, precision construction and efficient design in the "business department" of the pump! Note the oversize shaft. It's of high grade steel, machined all over, bronze covered, or solid monel metal or other alloy. Impeller is mounted on an enlargement of diameter at center of shaft and secured by feather key and lock nuts. All rotating elements are assembled on shaft and put in perfect balance before being placed in the pump. And, just as important, the impeller is hydraulically balanced — always receiving water from opposite sides in equal volume and pressure. Efficiency is increased, too, by the simply formed water passages in the pump casing of all "SL" Pumps. It's just another reason why there is no better buy in clear water pumping than a "Buffalo" Pump — for long life, for efficiency, for all-around economy.



"Buffalo" Double Suction Ball Bearing Pump, Type "SC", which is supplied with the shaft assembly shown above. For capacities from 10 to 10,000 gpm, clear water. WRITE FOR BULLETIN 955-N.



"Buffalo" Type "RR" Single Suction Pump, also used for clear water service, for high pressures, any temperature. . . in applications such as boiler feed. In 2- and 4-stage models. WRITE FOR BULLETIN 980-C.

"Buffalo" PUMPS

BUFFALO PUMPS INC.

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Canada Pumps, Ltd., Kitchener, Ont.

Branch Offices in all Principal Cities

A BETTER CENTRIFUGAL PUMP FOR EVERY LIQUID

CUTS DAMAGE AND REPLACEMENT COSTS

NEW HEAVY-DUTY INDUSTRIAL GRILLE

CUSTOMED FOR FACTORY USE AND ABUSE

This grille especially designed for Atomic Energy Commission.

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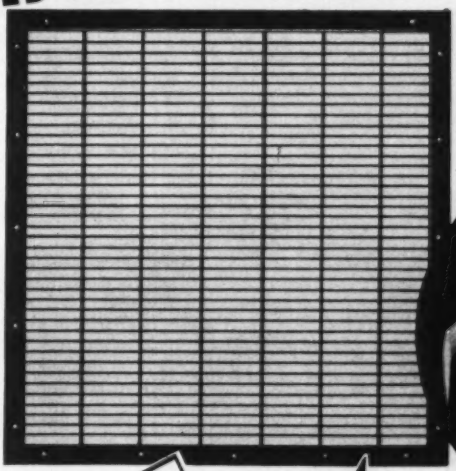
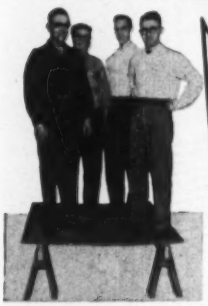
- 14 GAUGE STEEL BLADES
- VERTICAL SUPPORT BARS PLACED ON 6" CENTERS (14 GAUGE STEEL)
- STANDARD GRADE PRIMER COAT FINISH
- 16 GAUGE STEEL, EXTRA WIDE BORDER FOR EASY MOUNTING



At left—Grille face of LOWER WALL, INDUSTRIAL GRILLE. Note close spacing of extra-strength blades (⅜" centers).

Below—Close-up view of volume control section. Note famous solid section AIRFOIL LOUVERS. Each blade is individually adjustable. CONCEALED LOUVER SUPPORT eliminates mullions and butted construction.



At left— photo shows the 48" x 48" AIRFOIL INDUSTRIAL GRILLE supporting the combined weight of 4 Titus factory workers.

Air Foil
AIR CONDITIONING OUTLETS

Write for new, FREE complete catalog of Titus AIRFOIL air conditioning outlets — the most efficient grilles ever designed.

Free

More highly efficient . . . longer lasting . . . brand new . . . that's the AIRFOIL-DESIGNED, AIRFOIL-BUILT INDUSTRIAL GRILLE. Clean cut—compact—it is made in two sections . . . Grille Face and Volume Controller.

Rugged—braced for super-strength. The INDUSTRIAL GRILLE will stand up for years and years against the punishing knocks—jars—shocks—scratches and abuse that floor level grilles must take.

Volume Controller section features the famous solid section, streamlined AIRFOIL LOUVERS. Noise and turbulence are cut to a minimum. At the same time, perfect draft-free, air distribution is assured.

CHECK TYPE OF GRILLE ON WHICH INFORMATION IS DESIRED

- ☐ Air conditioning outlets
- ☐ Return air grilles and registers
- ☐ Volume controllers
- ☐ Perforated metal and ornamental grilles
- ☐ Door ventilators
- ☐ Special made-to-order grilles

TITUS MANUFACTURING CORP., WATERLOO, IOWA

- ☐ Rush information on Industrial Grilles.
- ☐ Send complete catalog.
- ☐ Send literature on above checked items.

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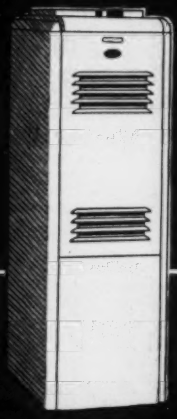

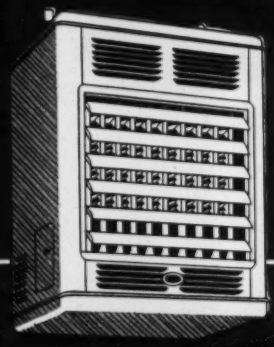

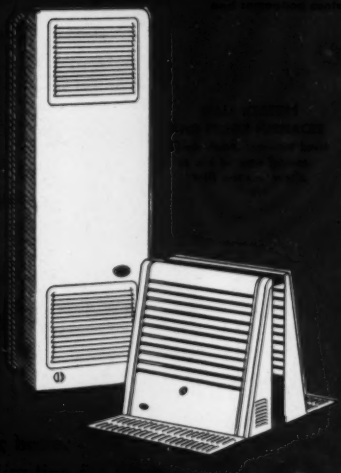

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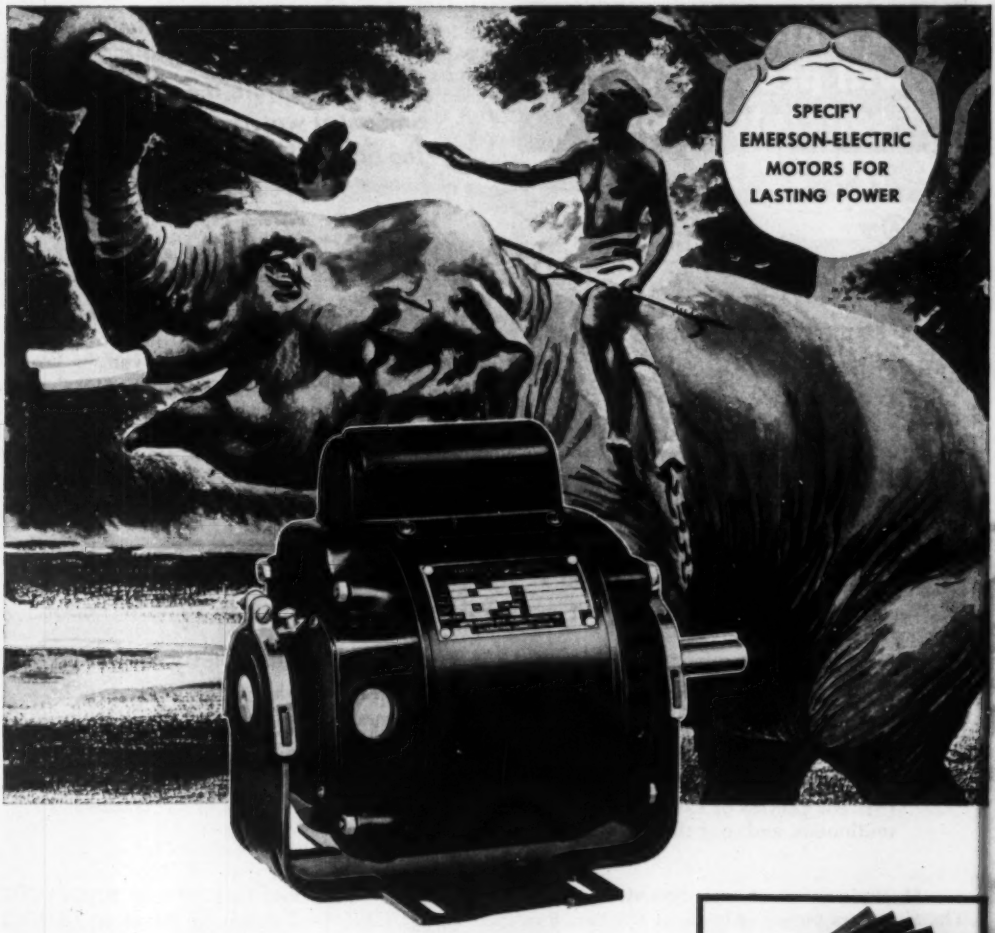

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"How Long Will It Last?" This question can be one of the most important points by which your product is judged. Further, the motor which you choose may be the determining factor.

Emerson-Electric Motors are *built* to last. Sound engineering and design principles, plus rugged construction have helped to build a reputation for long life into numerous nationally known products. These characteristics have also made them the standard for quiet, efficient, uniform power.

The wide acceptance of Emerson-Electric Motors by domestic, institutional and industrial consumers is based on a background of 60 years' experience. It's sales assurance to select motors with *lasting power.* Your inquiry is invited on this complete line of motors in the 1/20 to 5 h.p. range.

Write for these Emerson-Electric Motor Data Bulletins

Appliance and equipment manufacturers, with applications for motors of 1/20 to 5 h.p., can profitably use these reference guides. Specifications, construction and performance data are included for these motors:

- ☐ 148-A Capacitor-Start
- ☐ 148-B Split-Phase
- ☐ 148-C Integral
- ☐ 148-D Fan-Duty
- ☐ 148-E Oil-Burner
- ☐ 148-F Jet Pump
- ☐ 148-G Blower

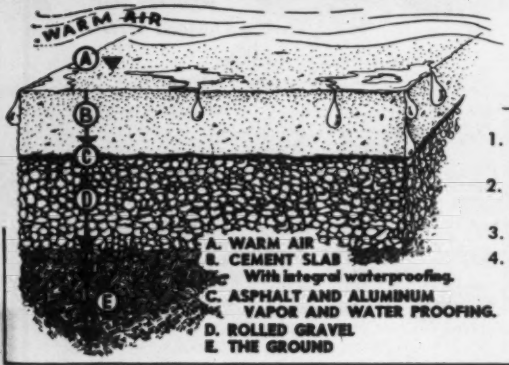
The Emerson Electric Mfg. Co.
St. Louis 21, Mo.

EMERSON ELECTRIC
MOTORS • FANS APPLIANCES

No waterproofing will prevent wet concrete floors

"Dampness on concrete floors is more often due to moisture from the air than from the ground. No amount of waterproofing beneath the slab will prevent this trouble."

From a "Progressive Architecture" Research Report, "Insulation for Concrete Floor Slabs on Grade."



1. The air (A) in immediate contact loses heat by conduction to the concrete (B).
2. The concrete (B) conducts heat through the layer of asphalt AND aluminum (C) to the gravel (D).
3. The gravel (D) conducts heat to the ground (E).
4. As the contacting air (A) loses heat, its capacity to retain water vapor is diminished. The excess condenses on the upper surface of the concrete floor.

THE EXPLANATION:

(1) Cold air can support little vapor. The excess falls out as water, or condensation, dew, etc.

(2) By direct conduction through and between solids, heat flows through the concrete floor into the earth, the flow in conduction being from warm to cold.

(3) Similarly, by conduction, heat flows out of the air in immediate contact with the colder concrete. That layer of air can no longer support all the vapor in it, so the excess condenses.

(4) The process of extracting heat out of the air at the upper surface of the concrete is continuous, and so is the formation of condensation.

Multiple sheets of accordion aluminum, *underneath* the floor, reflect back 97% of RADIATION. The air spaces permit only about 5% heat flow by CONDUCTION. There is of course no CONVECTION downward. Therefore with practically no heat loss, the concrete tends to follow air temperatures, and remains above the dew point. Ordinary insulations, being dense, are better conductors of heat. They are made more dense, still better conductors of heat, by the crushing weight of concrete, by inner condensation formation, and by ground dampness.

The commercial forms of multiple sheets of accordion aluminum are Infra Insulation Type 6, Type 4 and Type 4 Jr. (The built-in reflective air spaces are permanent.)

For new and inexpensive techniques in insulating floors and concrete slabs against heat flow loss, and condensation, as well as ceilings and walls, obtain FREE the revised 1951 edition of "Simplified Physics of Vapor and Thermal Insulation." Use coupon below.

INFRA THERMAL FACTORS, DOWNHEAT FLOW

Type 6	C.044	R22.72 equals 9" DRY Rockwool
Type 4	C.065	R15.38 equals 6" DRY Rockwool
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• NO EARLY CHANGE in construction trends is likely to result from a cease-fire in Korea, in the opinion of Thomas S. Holden, president of F. W. Dodge Corp., construction news and marketing specialists. Current programs of military construction and plant expansion will doubtless continue, he believes, for — although it has been significant and of major seriousness — the fighting in Korea has been a "hot episode" in a "cold war", and the cold war continues. Relaxation of limitation orders and credit restrictions on real estate loans seems unlikely for the near future, Mr. Holden also said last month . . . . Gas utilities and pipe line companies expect to spend around $4.49 billion for construction of new facilities and expansion of present ones in the five-year period from 1951 through 1955, according to a survey made by the bureau of statistics of the American Gas Association. The forecast for '51 is $1.54 billion . . . . . In a protest to the Petroleum Administration for Defense, H. Leigh Whitelaw, managing director of the Gas Appliance Manufacturers Association, opposed regulation by the federal government of natural gas for space heating and industrial use. Where restrictions on the use of gas have been necessary, the public service commissions of the various states have customarily issued limitation orders, he said, and therefore any limitations on a national basis are unnecessary, in the GAMA's opinion.

We doubt if it's a "significant trend" but at least it seems to be a "trend" of some kind. This year, both the American Society of Refrigerating Engineers and the American Society of Heating and Ventilating Engineers disregarded national holidays and went right ahead with technical sessions and other business matters, the ASRE in Detroit for its spring meeting on Memorial Day and the ASHVE in Portland, Oregon, for its semi-annual meeting on the Fourth of July. The ASHVE did knock off in the afternoon to see a rodeo, which is a safe and sane (for the spectators) way to celebrate the Fourth.

Large tonnages of production and dormant scrap can be found in plants and on industrial, commercial and civic properties. Dormant heavy scrap is all idle, obsolete machinery and equipment in plants, tools, dies and jigs, damaged or useless road building equipment, condemned bridges and other steel structures or things made of steel. It can be found almost anywhere, must be declared obsolete by someone in authority, sold as scrap, and started moving back to steelmaking furnaces . . . . . .This year steel companies will need about 32,500,000 tons of purchased scrap — some 3,500,000 tons more than last year's record tonnage. Next year they will need over 35,500,000 tons. These additional tonnages of scrap do not have to be manufactured — they need only to be *found*. When scrap has been found, see that it is moved to the nearest scrap dealer, urges the American Iron and Steel Institute.

HEARD ON TELEVISION: *"It's hot in here; throw another log on the air conditioning."*

Aluminum invasion pipe, "first cousin" of aluminum irrigation pipe, recently underwent rugged tests in Alaska, at Yuma, Ariz., and at the Army engineering research and development laboratories, Fort Belvoir, Va. Their purpose was to determine the suitability of aluminum pipe lines for carrying fuel, oil and water to operation areas of a mobile army and an emergency-based air force.

As a result of the tests, advantages of aluminum invasion pipe seemed to be: rapid laying of pipe line, ease in transport of fluids, reduction of the traffic problem in a congested battle area and conservation of fuel (fewer fuel carrying vehicles which eat up supply). Standard load for a helicopter is twelve 20 ft lengths of aluminum pipe (approximately 780 lb.)

THE EDITOR'S PAGES

It's not an application that was given consideration, we're sure, in the original development of the small plug-in dehumidifiers or air dryers which have proved useful in recent months in a variety of cases, but on at least two recent occasions these units have been employed to stop further damage to books and papers after large fires. Dehumidification after the big state office building fire in Lansing, Mich., last February was credited with salvaging thousands of volumes (see HPAC, May 1951, page 77). In June, a fire in the library of the Ohio state archaeological and historical museum, Columbus, endangered rare books, state papers and collections of old letters and newspapers. Twenty "Oasis" air dryers prevented extensive moisture damage.

From time to time, reports of certain actions of the sectional committee B31 on the ASA Code for Pressure Piping, sponsored by the American Society of Mechanical Engineers, are issued for the information of interested parties. While these do not constitute formal revision of the code, they may be utilized in specifications, or otherwise, as representing the considered opinion of the committee. . . . . Pending revision of the Code for Pressure Piping, ASA B31.1-1951, the sectional committee has recommended that the ASME, as sponsor, publish in its journal, Mechanical Engineering, selected interpretations so that industry may take immediate advantage of corresponding proposed revisions. . . . Case 5 follows (Cases 1 to 4 were issued before the latest revision of the code). . . . *Inquiry:* In view of the data in the Miller-Heger report, may increased

stresses be used under Section I for 1¼ percent chromium ½ percent molybdenum material conforming to ASTM specification A 158 Grade P-11 and comparable forging grades? . . . . *Reply:* It is the opinion of the committee that pending a general revision of the stress tables, the following stresses may be used under Section I of the code for ASTM specification A 158 Grade P-11 material and comparable forging grades:

Temperature, F	S value, psi
650	12,000
700	12,000
750	12,000
800	12,000
850	11,500
900	10,500
950	8,800
1,000	6,250
1,050	4,400
1,100	3,200

It is important for the heating contractor to take advantage of some of the newer things in the building industry — like weatherproofing — which enable him to reduce the original cost of the heating system, to offer fuel economies, and to achieve greater comfort, said Professor J. R. Carroll, of the University of Illinois, at the fifth short course in hot water and steam heating held at Navy Pier, Chicago, under the sponsorship of the U. of I. and The Institute of Boiler and Radiator Manufacturers. Insulation, by making it possible to heat a structure with a smaller heating system, helps the heating contractor to improve his competitive position, he said. Insulation of older structures helps prolong the life of the heating plant because it reduces the load.

At the new factory addition of McCulloch Motors, Los Angeles, manufacturer of chain saws and gasoline engines, 50 blower type electric heaters, of 13 kw capacity each, were installed, according to the Kilbury

Mfg. Co. Each unit has an individual thermostat for zone control, and heats independently or in unison with other units. The units have high velocity blowers designed to put heat down on the floor through vertical ducts or by free throw. The heat is mixed with the cold air on the floor to minimize warm air stratification and roof heat losses. The bases of the heaters are 9 ft above the floor, and wherever possible, the inside channels of steel I beam columns are utilized for shielding the ducts.

"Hot and cold flashers" is the term used by an operating engineer we know for the few people who seem to have constant complaints about temperatures in the air conditioned building for which he's responsible. A girl in one of the offices in the building seems to be his particular problem — she threatened to quit her job and get one in more comfortable surroundings on a day when the inside temperature was too warm for her — 74 deg, with an outside reading of 98! But most complainers are more reasonable about it after he has checked the trouble (or the imagined trouble).

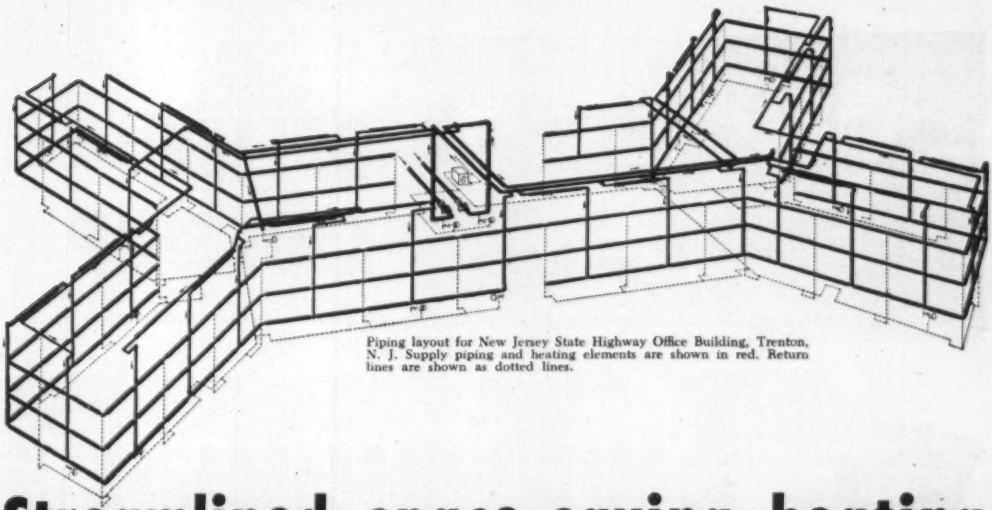
At the mid-year meeting of the Building Industry Employers of New York State, held at Lake Placid and attended by more than 200 contractors from 22 cities, a resolution was unanimously adopted calling for the formation of a national association of local builder's exchanges and state associations of builders to "protect the building construction industry from adverse governmental regulations." Some hope for relaxation of NPA controls early in 1952 was expressed at the closing session of the convention by William E. O'Brien, director of the division of industrial expansion for NPA. He told the contractors that "for the balance of this year the chief shortage will be steel, but after that we may be able to do away with some controls in the construction industry."

A recently appointed committee on the Scheme for Identification of Piping Systems, American Standards Association No. A13, issued originally in 1928 and re-affirmed in 1947, will undertake revisions in accordance with recommendations of an ASA conference held last October. . . . In general, the recommendations favor legend markings for purposes of primary identification, and color markings for such secondary purposes as indicating the nature of the contents — that is, whether or not the material is of itself hazardous to life or property —, with the alternative that the nature of the contents could also be indicated by legend. . . . F. T. Clarke, supervisor of safety, General Electric Co., is chairman of the committee.

Knud C. Thommesen, owner of the Yankee Clipper diner at Valley Stream, Long Island, and who has been in the diner business for over 20 years, considers air conditioning an absolute "must" for diners, the United States Air Conditioning Corp. reports. "No modern diner is com-

plete without it, and, aside from the comfort considerations, we have found that air conditioning keeps our diner free of smoke and its windows free from condensation, increasing its visual appeal", Mr. Thommesen says. . . . . A 15 ton unit keeps the 70 ft Yankee Clipper comfortable.

It is a good idea to select baseboards with the same footage as the radiator you are taking out. Then you won't be throwing the system out of balance. It is entirely possible to install baseboards with one pipe steam heating systems. If you have to install fin type baseboards with old style cast iron radiators, be sure to zone the system, Dan Stevens recommended at the fifth short course in hot water and steam heating held at Navy Pier, Chicago, and sponsored by the University of Illinois and The Institute of Boiler and Radiator Manufacturers.

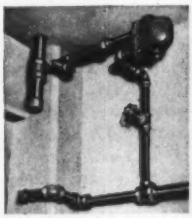


Piping layout for New Jersey State Highway Office Building, Trenton, N. J. Supply piping and heating elements are shown in red. Return lines are shown as dotted lines.

Streamlined space-saving heating

Aerial view of New Jersey State Highway Office Building. Micklewright & Mountford, Trenton, Architects. Runyon and Carey, Newark, Consulting engineers. Philip S. Slack & Co., Trenton, Heating Contractors.

Webster Walvector spreads the heat . . . no cold spots. Note supply and return risers; location of Walvector trim piece connections below window mullions facilitating installation of office partitions.



Typical Drip Connection.

Moderator Control Valve.

The new $1,700,000 headquarters and office building for the New Jersey State Highway Department, sponsored by Governor Alfred E. Driscoll, is marked by three innovations: (1) for economy, streamlined modern design in place of usual monumental architecture; (2) for efficiency and parking ease, location outside of city; (3) streamlined, space-saving heating with Webster Walvectors. The alert cooperation of contractor Philip S. Slack in working out details of the new developments with the architects and engineers, contributed much to the success of the installation.

A Webster Moderator System provides "Controlled-by-the-Weather" heating for this modern building with Webster Walvectors equipped with integral tube orifices to spread the heat along exposed walls. Webster Convectors are used in stairways and Webster-Nesbitt Unit Heaters provide supplemental heating in corridors.

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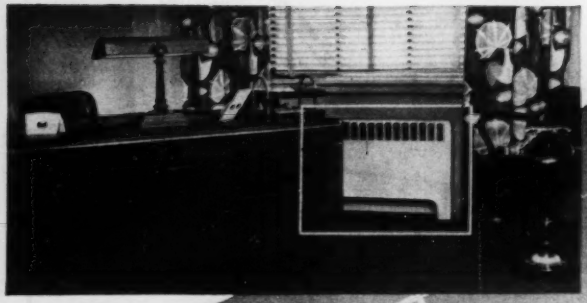
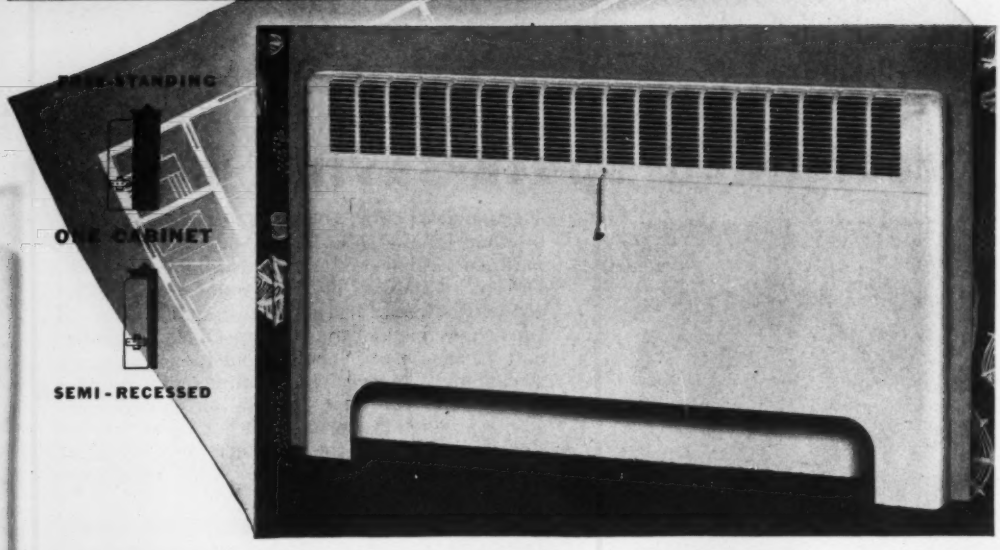
OF STEAM HEATING
"Controlled by the weather"



OFFICE CLOSE-UP



Use of Nesbitt model U reveals intelligent planning and good taste

When you step into one of today's modern, well designed offices,
step a little nearer for a close-up view of the NESBITT CONVECTOR.
For more and more planners are "closing the gap" between their smart new ideas
and the tell-tale dating of old fashioned radiators
by specifying NESBITT MODEL U CONVECTORS as the medium of heating.
NESBITT CONVECTORS are completely satisfying in both design and efficiency.
They are light in weight, fully assembled, and easy to install,
and they deliver the uniform comfort synonymous with *convection* heating.
To homes and apartments, add offices and commercial installations
when you think of NESBITT CONVECTORS. Send for Publication 262.
Manufactured by John J. Nesbitt, Inc., Philadelphia 36, Pa.

NESBITT Convectors | ARE SOLD EXCLUSIVELY THROUGH PLUMBING AND HEATING WHOLESALERS

"Open for Discussion"

• How about expressing your views on one of the articles in this month's issue of HPAC, for publication in these pages? Your comment on a controversial point, or additional information based on your experience, would be of interest and help to others. Or perhaps you'd like to say a little on some other matter of importance to plant engineers, building engineers, operating and maintenance men, heating, piping and air conditioning engineers or contractors? We follow here each month the practice at engineering society meetings of providing an "open for discussion" period. You are invited to participate. Address the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

HOW TEST FANS FOR NOISE LEVEL?

In his article on fan noise levels in the June HPAC, R. A. Gerlitz has opened up a controversial subject which is worthwhile discussing.

A more detailed method of sound rating than is now available is being considered by the Industrial Unit Heater Association at the present time. This method consists of taking sound level measurements as close to the source as possible, in this case the microphone being located 6 in. from the panel.

The objective of this method is to get away from the variation of testing rooms used by the different manufacturers and to present something to the architect or professional engineer that will have some definite meaning. Tests in different acoustically treated laboratories on the same unit heater have indicated good agreement of sound level readings when such readings are taken close to the source.

Since sound level readings are made up of the sum of the direct sound wave and that of the reflected wave, it is quite apparent that a unit will be quieter in a well acoustically treated room than in one less acoustically treated because of the lesser reflectivity for a measurement taken a considerable distance from the source. When a measurement is taken close to the source, it represents more closely the direct sound, which varies inversely with the square of the distance.

When decibels are plotted against distance from the source, the shape of the curve is governed by the acoustic properties of the room and the only predictable points on these curves are the origin, which is common to all curves, and the levels at which they asymptote.

It has also been suggested that the rating be given in terms of acoustic power output for a source noise, the advantage of this method being that the architect or professional engineer could then predict what noise level the unit would make in a particular room.

Unfortunately, many people associate fan noise with tip speed and while this is so for a particular fan design (a fan running at 1150 rpm will be quieter than the same fan running at 1750 rpm) it is not true for many designs inasmuch as high tip speed fans often operate more quietly than low tip speed fans for the same performance because of the different aerodynamic characteristics of the blades.

The use of horsepower as a criterion for fan noise might be misleading as a high speed — low horsepower unit could easily make more noise than a larger horsepower unit at a low speed.

Symbolic ratings — such as "Q" suitable for quiet applications, "C" suitable for commercial applications, and "I" suitable for industrial — as suggested by Mr. Gerlitz really wouldn't mean too much without stipulation of room and test conditions, in my opinion.

I would be in favor of a system that would qualify the fan by its acoustic power output at the source with its loudness in phons. Some stipulation as to meter calibration should be made because sound level meters today vary considerably in their recordings.

Of great importance, however, is the installation of the fan unit, as a poor installation would cause considerable increase of sound level over that recorded in the laboratory.— Adam Currie, Chief Engineer of Research and Development, L. J. Wing Mfg. Co.

In reply to Mr. Currie's remarks on testing fans for noise, the method of taking sound level measurements close to the source (6 in. distant) he suggests is one currently in use by the National Electrical Manufacturer's Association. It does minimize the influence of the test room because the reflected sound becomes a smaller portion of the total at the microphone. However, unless readings are taken at many points and averaged, results are likely to be inaccurate. With most machines, the radiated sound pressure varies about the surface of the machine and may be highly localized in spots. Unless the microphone happens to catch these maxima it will be missing the *sources*, thereby defeating the purpose of the "close to source" method.

My article did not intend to suggest that horsepower be used as a criterion for fan noise. It merely pointed out that there is a strong tendency to associate fan noise level directly with tip speed, when actually it varies more closely with horsepower. Both factors should be considered together.

I certainly agree that symbolic ratings (such as "Q," "C" and "I") wouldn't mean too much without the stipulation of room and test conditions. Exactly the same is true for any conceivable method of rating fans, as has been done in the case of the National Association of Fan Manufacturers Standard Test Code. The symbolic method was mentioned

as one possible means of indicating the amount of *annoyance* produced, thus taking into account not only noise level but also noise quality. The point is that a decibel rating alone does not tell the whole story. Symbolic ratings would of course have to be reliable, and could never be adopted universally unless they were more closely defined — by noise level and pulse frequency, for example.

I see no object in going to extremes to get highly accurate decibel measurements and at the same time ignoring other factors which affect the amount of annoyance produced. It is almost an everyday occurrence to hear low-db staccato noises which are more annoying than high-db smooth noises. After all, it's the annoyance that loses the customer.

Incidentally, one leading manufacturer of sound level meters says, "On average sounds — different makes and models of sound level meters meeting the ASA standards will generally read alike within a db or so . . .".—R. A. GERLITZ, Chief Engineer, Propellair Div., Robbins & Myers, Inc.

APPLYING HEAT PUMPS TO POWER HOUSES

I HAVE READ Fred T. Downing's discussion in the June issue on the application of the heat pump to an hypothetical hydroelectric power house with considerable interest. While I am in agreement with Mr. Downing's conclusion that such a plant, located in the southwestern area, and with its adjacent reservoir as a heat source, is an ideal application for a heat pump installation, I would question his method of arriving at that conclusion.

To begin with, his balance of the heating against the cooling load is open to question. In a building such as he describes, internal heat loads plus high summer design temperatures would bring the calculated heating and cooling loads to very nearly equivalent figures. When it is considered that this type of building would be maintained under control 24 hr a day and would therefore not require excess capacity for quick heating up or cooling off, it can readily be seen that the cooling load becomes the governing factor in the sizing of equipment, and in this case a plant of approximately 50 tons capacity is indicated, in my opinion.

The area under consideration enjoys a summer design dew point of 71 deg. An examination of the lake water temperature curves in the light of the fact that the temperatures indicated are those at the surface and are subject to more variation than are those several feet below the surface, indicates the need of extensive dehumidification for any air used to ventilate the lower levels of the building, if condensation on walls, floors and equipment is to be avoided.

A second question might be raised on Mr. Downing's choice of 5.55 as an average value for the heat pump coefficient of performance. The figure might not be out of line for a direct expansion system with the most rudimentary auxiliaries, but if we are to assume a 50 ton plant, experience indicates that approximately 20 hp in auxiliary motors — fans, pumps, etc. — would be required, and the power consumed by this equipment must necessarily be included in the determination of the COP. This would reduce the assumed COP directly to 4.25, and would reduce the seasonal average still further, because, although the power consumed by the compressor would be reduced under reduced loading conditions, that consumed by the auxiliaries would remain constant.

The cost figures, both installation and operating, would then approximately double those listed. The operating costs would still represent a sizable saving over direct electric heating.—FRED L. MCFADDEN, JR., Zumwalt and Vinther, Consulting Engineers.

IN REPLY TO Mr. McFadden's comments on my article on the heat pump, the hydroelectric plants in the southwestern area are usually located to secure a favorable hydraulic head in respect to tail water and channel capacity where power is integrated with the reservoir. The pumping horsepower would be a minimum with the water head available in such plants, except for very low head power dams. In fact, there are several power house projects in the south where the available water head is sufficient for evaporation and condenser work without pump circulation.

The heating and cooling cycle in several power projects in this area is limited to certain prescribed spaces in the power house, such as turbine and generator rooms, control room and some office space. A survey of these projects indicates that the cooling load considered essential to the power house is usually zoned and amounts to about 50 percent of the heating load required. In most cases dehumidification of galleries, draft tube chambers, and inspection tunnels is not done by refrigeration equipment but often performed by natural cross-shaft circulation and mechanical air movement.

It seems proper, therefore, to assume that the cooling load would be considerable less than the heat load on the premise of the limited scope of cooling effect needed. In fact, the reservoir temperatures in some projects are sufficiently low to afford circulation through coils or unit coolers and thus secure dehumidification at very low cost.

It was set forth in my article that the COP of 5.55 was based on 50 F reservoir water and compressor input only. Investigation and experience with small tonnage heat pumps does not substantiate 40 percent of the total system input needed for auxiliaries. It is rather obvious that the COP would be lower than that used if the fan and control input were included. In addition, the pump input was not used in the article for it was considered that, generally, the reservoir head available would be a large share of any pumping head.

It is believed that even though the COP were reduced to 4.25 as stated, the operating cost would not be doubled, as stated by Mr. McFadden, because in power house conditioning the loads are generally of the same pattern throughout the year and not subject to space changes or high and low temperature differentials that might be expected in other types of structures. It is dictated by experience that in hydroelectric plants the internal heat loads are not too great nor the heat gain in summer excessive due to the construction features and proximity to large water bodies at temperatures averaging much lower than outside. In fact, the premise of my paper was based on the survey of several plants actually using much more heating than cooling effect dictated by the economic factors in power house design. Costs and design layout were taken from actual plant operation.—FRED T. DOWNING.

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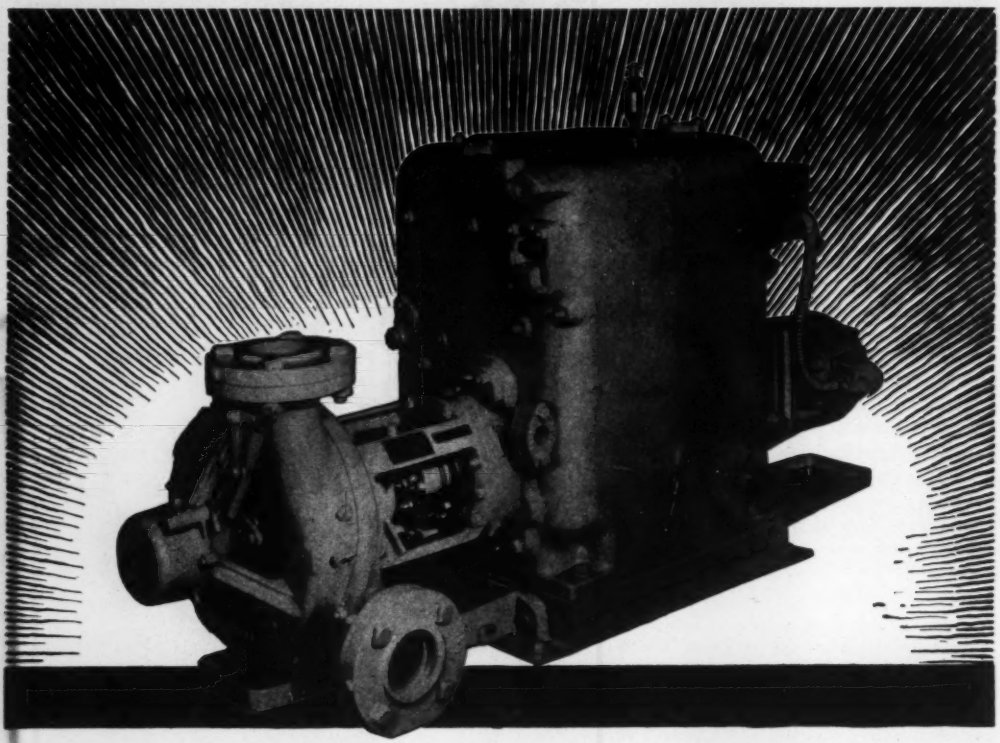

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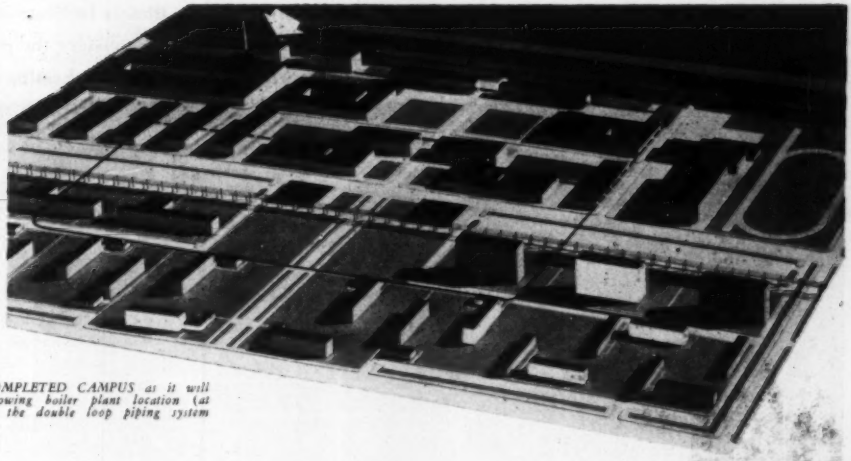


MODEL OF COMPLETED CAMPUS as it will be in 1960, showing boiler plant location (at upper left) and the double loop piping system

Matching Increasing Heat Demands With Efficient, Low Cost Service

By L. C. Hardison, Mechanical Engineer, and W. J. Parduhn, Superintendent
Buildings and Grounds Department
Illinois Institute of Technology

NO COLLEGE CAMPUS is "built" at one time; rather it is a case of "just growing" over a period of many years. The heating problem is thus one of matching increasing demands with efficient, low cost service — and it is as widespread as it is interesting.

Illinois Tech now stands at the mid-point of such an expansion period. The first half of this problem has been answered by a new 60,000 lb per hr pulverizer steam generating unit and over a mile of modern underground piping, adequate for present needs and designed to grow with the college. The problems of these past 10 years, together with the operating data obtained during the past heating season, will serve as yardsticks for measuring future needs.

Illinois Tech was formed in 1940 when the two parent institutions, Armour Tech and Lewis Institute, consolidated. Plans were drawn up for a new "Technology Center", to be built around the old Armour campus as a nucleus. The five Armour buildings, dating back to 1891, were grouped around 33rd and Federal Sts. on Chicago's South Side, in the heart of what had become one of the nation's most deplorable slum areas. Over 100 acres of slums were to be wrecked, the grounds cleared and 40 modern academic, research and residence buildings built.

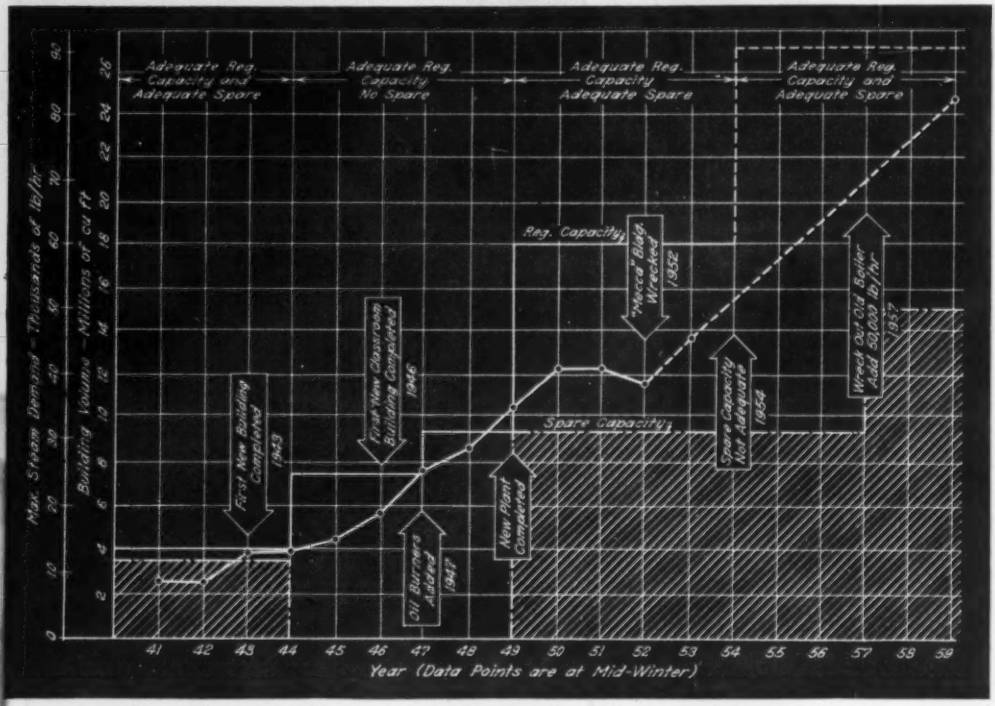
The first of such construction began in 1942 with the building of a Metals Research building for the new-born Armour Research Foundation (an integral part of IIT). The ice had been broken, and expansion continued with increasing momentum.

The first stages of expansion presented little problem in the way of steam services. The Armour campus had been supplied heating steam by two chain grates and about 100 ft of piping for a period of nearly 50 years. With the completion of new buildings, they were tied into the existing system, and did little more than bring the boiler plant closer to its 750 hp rating and increase its efficiency.

Condensate Meter Determines Steam Figure

In 1946, however, when the first new academic building was completed and placed on the line, it became apparent that only a few more years would bring the heating load far beyond the capacity of the existing plant. In order to answer the questions "When will this happen?" and "How much capacity will we need?", a drum type condensate meter was installed in the new building and a careful record of steam consumption kept. A figure of 0.0033 lb per hr per cu ft of building volume was determined as a maximum load for buildings of this type. The same figure has been used ever

With the completion of a new, modern central heating system, Illinois Institute of Technology pauses at the mid-point of a 20 year expansion program to consider the problem of matching rapidly growing steam requirements with efficient, low cost heating service


Adequate Reg. Capacity and Adequate Spare
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Adequate Reg. Capacity Adequate Spare
Adequate Reg. Capacity and Adequate Spare
Reg. Capacity
Spare Capacity
First New Building Completed 1943
First New Classroom Building Completed 1946
Oil Burners Added 1947
New Plant Completed
"Hecca" Bldg. Wrecked 1952
Spare Capacity Not Adequate 1954
Wreck Old Boiler Add 50,000 lb/hr 1957
Max. Steam Demand — Thousands of lb/hr
Building Volume — Millions of cu ft
Year (Data Points are at Mid-Winter)

PLANT CAPACITY AS FUNCTION of maximum steam demand from 1940 to 1960. Top solid line shows regular capacity; broken line shows capacity of non-operative standby (spare). Predicted data are shown dotted. Spare requirements are set to allow at least 75 percent load when largest unit is out of service. Curve indicates that an additional 30,000 lb per hr unit will be required about 1954, and that the old 30,000 lb per hr plant will have to be replaced by a new 50,000 lb per hr unit in '57 or '58

since, with startlingly precise results.

By 1947, new academic and research buildings had swelled the campus size from 2.5 million cu ft to nearly 8 million, and the old boiler plant carried its rated load for a good portion of the winter. The search for a new plant was well under way, but none of the leads obtained had been fruitful. During the following summer, the chain grates were replaced by oil burners, and the capacity of the boilers increased sufficiently to meet the demand expected during the next heating season.

The size of the completed campus was estimated at 22.5 million cu ft of building volume, and the future steam requirements pinned down to something like 70,000 lb per hr. Sufficient standby capacity would nearly double this figure.

The purchase of package units as a temporary measure, as well as the redesign of the existing plant for higher output, were discarded as halfway measures that would bring the long range problem no closer to a solution. The possibility of buying steam from an outside company was considered, and rejected as financially impractical.

New Steam Plant Constructed

Finally, in 1948, at a time when the old plant was pushed to continuous full-load service with no reserve capacity, it was made known that one 60,000 lb per hr unit of a steam generating plant operated by the Army at an ordnance plant was no longer in service. This modern unit, erected in 1948, would meet immediate requirements for full load service, but more important, would also serve as the backbone of a steam service adequate for the completed campus.

Negotiations for the plant were initiated and completed in that same year. Plans were drawn up immediately for transplanting the unit and its auxiliaries, and construction of a modern structure to house it on the IIT campus was begun.

The plant was completed in 1949 and pressed into immediate service. Together with nearly a mile of new

underground piping, it now serves all regular steam requirements of the campus, and is a model laboratory for engineering students. The old plant was retired according to plan, and meets only standby requirements. It will continue to do so until further demand brings about the purchase of a second unit for the new plant.

The boiler is housed in a modern four story yellow brick and steel structure, in keeping with the overall architecture of the new Technology Center. Exposed steel beams and columns stress function as the No. 1 design feature, and convey the same rugged, matter-of-fact appeal common to all the new campus buildings. The plant is located at the southwest corner of the campus, convenient to both the railroad and a truck lane. Plenty of room for additions to house future units is available, without the necessity of cutting into valuable coal storage space.

The 200 ft stack, also of yellow brick, stands as a separate structure, and does not require the waste of precious in-the-plant space. Other than this and a gas booster in a separate building, the boiler and auxiliaries are completely enclosed.

Equipment Location Is Functional

Location of equipment and facilities within the plant follows the same compact, functional pattern. A high degree of centralization of controls and attention-requiring auxiliaries places the entire plant at the operator's fingertips. Equipment is located according to the necessity of attending it.

On the main deck are the control panel, boiler feed pumps, feedwater treating equipment and coal scale, all within the operator's range of vision. Here the engineer also has direct access to the plant railroad siding and track hopper. Modern washroom facilities and a remarkably clean and quiet office are on the same floor and are within easy reach. Telephones are located at the panel and in the engineer's office. The room is well lighted and windows run the full length of two sides of the plant for good ventilation.

Beneath this deck, on the ground floor, are the water storage tanks, pulverizer, ash hopper and unit electric substation. These require little attention but are available for frequent inspection and servicing. The yard hopper is immediately outside the building, on the same level, as is the gas booster.

Above the main deck, in order, are the silo or ash deck, the deaerator deck and the fan and coal feeder deck. All of these are arranged at convenient elevations so that equipment and valves are easily accessible.

The plant and equipment were erected with a minimum of changes required. General contracting for the job, including all of the outdoor piping and the erection, was done by the buildings and grounds department of Illinois Tech. This arrangement had a number of advantages, the greatest of which was that of "knowing the plant" *before* it was put into service.

The boiler is rated at 60,000 lb per hr, firing pulverized coal, at 200 psi steam pressure. It is operated at 100 psi at present, insuring high efficiencies over a wide load range due to the overdesigned heating surface. (While the plant seldom reaches 50 percent of rating, efficiency averages around 84 percent.) Firing of city dump gas during the summer further aids in establishing high "dollar efficiency" and at 10 percent load, operation is as economical fuel-wise as when firing pulverized coal. The boiler is of bent tube construction with one 45 in. steam drum and a 37 in. mud drum. The furnace volume is 2640 cu ft, with 1265 sq ft of effective area in the furnace and 6000 sq ft in the boiler.

Pulverized coal is fired through two burners, located in the front wall of the furnace, fed by a 75 hp ball mill (capable of handling 6000 lb per hr) located directly below the burners on the ground floor. Feed into the pulverizer is vertical, from a 50 ton bunker *above* the main deck. The automatic coal weighing equipment is interposed between the two, adjacent to the control panel. Conveyors carry the coal to the bunker at the top of the plant directly from the track hopper. Overflow from the bunker may be dropped to the yard through an overflow chute. One thousand tons (20 days' supply) is stored in the yard adjacent to both the plant and the siding. A minimum of coal handling in the yard is necessary, and this is done with a bucket type loader.

Summer gas is taken from the city mains during months specified by the utility company and compressed to 5 psi by a blower at the base of the stack. The combination of this low cost gas and carbon or dust type coals allows high efficiency, low cost steam production on a year 'round basis.

Make-up water is taken from the city water system, treated by a combination cation-anion (sodium and hydrogen zeolite) process, and passed through a coke bed degasifier, with both treatments occurring in the same tank. Oxygen is removed from the water in a contact type deaerating heater, located above the boiler, and the feedwater heated to saturation temperature at 5 psi. Feed to the boiler is through three pumps located near the control panel. Two of the three are steam turbine driven by 100 psi steam exhausting into the deaerator. The third is electric motor driven. Capacity of these pumps is 125 gpm each at 150 psi head, so that any one pump can handle the boiler in an emergency.

Both induced and forced draft fans are located on the top deck, well above the boiler, and both are automatically controlled. Capacities are 79,000 lb per hr for the forced draft and 94,000 lb per hr for the induced draft fan. Air is preheated to 365 F by a vertical tubular type preheater, which allows stack temperatures of 340 F.

Ash is handled by a cyclone type fly ash precipitator located above the boiler, and stored in the silo for removal by truck at convenient intervals.

Fully automatic control perhaps has the drawback that operating engineers may get "out of practice". For this reason, the plant is frequently run on manual control, for no reason other than that of keeping the operators "sharp", and to insure safe handling of the plant in emergencies.

Double Loop Piping System

New underground piping supplies all of the new buildings, yet the entire original system is still in service, and will not have to be replaced for another five years. Only one 200 ft length of main has been installed on a temporary basis. The piping system consists completely of 8 in. mains and 4 in. returns, arranged in a double loop, or "figure 8", with the plant located at one corner of the "8". This arrangement allows

for feedback to any point in the system in case of emergency.

Served by the system are 38 buildings, ranging from the Mecca Flats (described as "The Strangest Place in Chicago", in Reader's Digest for February 1951) to the most modern research buildings in the city, with several of the latter in the planning stage at this writing. A wide variety of individual systems — including one pipe steam systems and zoned hot water convector and radiant type installations — is found in the various buildings.

Complete metering of condensate in each building provides a wealth of information on the steam requirements for each type, and pinpoints the high consumers. Now, for the first time, piping losses, hot water loads and pick-up loads can be determined accurately. A great deal of work is being done on the basis of this data to cut dollar losses in the system.

Controlled Expansion Will Meet Future Needs

Neither the plant nor the piping are complete as they stand, for requirements will continue to increase. Eventually a second, and perhaps a third, unit will be added to the plant, and piping loops will be completed as the slum clearance program develops. The present plant together with a "tight" piping system, however, will be adequate for several years. When increases in capacity are required, they will be made on the basis of history *and* data now being obtained. Thus, *controlled expansion* of steam service to meet requirements will insure that requirements are met *before* they exist.

ALMOST ALL A.C. EQUIPMENT VITAL TO DEFENSE

VIRTUALLY EVERY TYPE of air conditioning and refrigeration equipment made by Carrier Corp. has been classified as essential to some aspect of the defense program.

Laboratories and research establishments have called for a wide variety of air conditioning equipment to maintain temperature and humidity control over experiments, and for refrigeration units for special purposes.

Packaged air conditioning units of the type used for many years in stores and suites of offices, and packaged laboratory units which maintain even more precise control of temperature and humidity levels, are being shipped for wind tunnel and ordnance test rooms and animal laboratories.

In one case, a wind tunnel at an Air Force base has obtained a self-contained conditioner to cool the room where the testing section of the tunnel is located, since the friction of air passing at high velocities through the section generates heat.

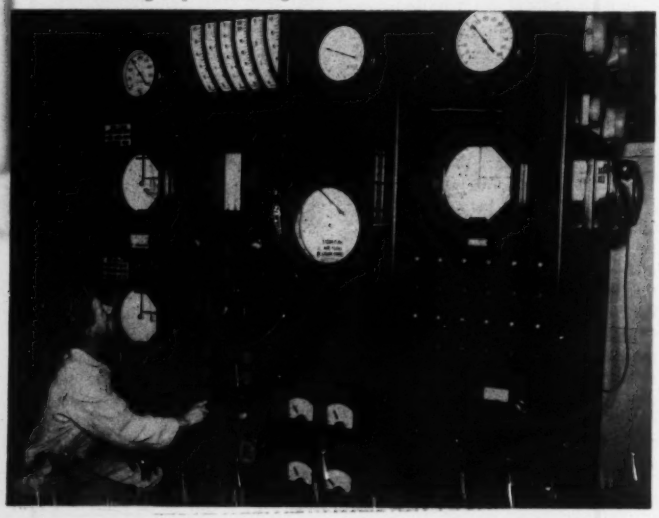
Wind tunnel, engine testing and other research installations have also placed orders or requested quotations for centrifugal and reciprocating refrigeration equipment, cooling coils, cold diffusers, and central station air conditioning apparatus.

Low temperature research and processing requires substantial quantities of special refrigeration apparatus. A centrifugal refrigeration installation completed some time ago for the Wright-Patterson field all weather laboratory's environmental testing facility is chilling brine for cold weather testing to temperatures of minus 125 F. A pharmaceutical company is obtaining equipment for processing in the ultra-low temperature field, under a "DO" order, and other orders of the same type are now being negotiated.

Air conditioning of defense factories in order to produce war supplies faster, cheaper and better is developing swiftly. One defense rated contract has been received for air conditioning a textile plant, and another large new plant in the South also will be completely conditioned. Plants for manufacturing mechanical equipment and other war products, including some which have used air conditioning in the past and are anticipating expansion for defense program purposes, are obtaining quotations on air conditioning and refrigeration equipment. Equipment for industrial processing involved in defense production is now on order. This includes centrifugal refrigeration machines of special design and centrifugal gas compressors.

Army, Navy and Air Force facilities are taking many items of air conditioning and refrigeration equipment. The list includes packaged year 'round air conditioning units, designed originally for residences, to be used for hospital installations at a large Army base. Self-contained units have been purchased for airport control towers, and for parachute drying and storage at an Air Force base in the South. A number of conditioners and matching cooling towers have been ordered by the Army for shipment overseas. The Navy is obtaining a special absorption refrigeration machine for installation in one of its ships.

OPERATING ENGINEER adjusting controls during manual operation. Plant is often run on manual control to keep operators "sharp", insure safe handling of plant in emergencies



Gun Type Burners Ignite Horizontal Rotaries

M. A. Schneider, manager of the heating division of Arrow Petroleum Co., describes novel application of domestic oil burners to ignite the main burners in a building where no gas line was available

DOMESTIC OIL BURNERS are used to supply ignition for horizontal rotary cup oil burners in a novel application at the Illinois Bell Telephone Co.'s Merrimac exchange building in Chicago.

The installation had to be of a fully automatic nature. As no gas line was available in the building for ignition of the main oil burners, which use No. 5 fuel oil, high pressure gun type burners using No. 3 oil supply ignition. These ignition burners are mounted at a 45 deg angle to the main burner flame, spaced so the ignition fire intersects the main flame approximately 12 in. forward from the cup to insure smooth and positive ignition.

One Photocell Proves Two Burners

An electronic photocell is mounted in the blast tube of the ignition burner so as to prove the presence of the ignition flame before allowing the main burner to operate. In addition to proving this ignition flame, this photocell "sees" the main flame and allows the main burner to continue in operation after the ignition burner is turned off, which occurs about 30 sec after the main burner starts. If for any reason the main flame should fail during operation, this photocell will immediately stop the main burner and sound an alarm bell. It is necessary to reset the control manually until the trouble is located and corrected.

This design not only allows full safety protection but uses only one photocell unit to positively prove two separate burners.

In addition to the above controls, a completely automatic damper is installed in the boiler breeching which moves to the wide open position before allowing the burners to start. After the main burners are in operation, the damper then maintains a fixed draft in the firebox. When the burners are not firing, the damper is in the closed position to sustain the boiler temperatures

The boilers are steam boilers and the main operating control consists of a pressure limit for each. These controls are adjusted in such manner that one boiler will operate until such time when it cannot hold pressure due to falling outdoor temperatures, when the second boiler will start and thereby hold the pressure. If the steam load decreases, the second boiler automatically turns off and stands in readiness if or when needed.

NPA FORM CMP-4C IS FILED FOR CONSTRUCTION

THE NATIONAL Production Authority's form CMP-4C is used for requesting an allotment of controlled materials and/or a DO rating for other materials and equipment pursuant to CMP regulation 6. It may also be used for authorization to commence construction pursuant to the NPA order M-4, for which purpose it replaces form NPAF-24. Applications for adjustment of or exception to M-4 use NPAF-24. Copies may be obtained from the NPA at Washington 25, D.C., or from NPA field offices.

Installation, Maintenance Facilities Influence Piping Joint Selection

There is no one type of piping joint which should be used universally, says G. W. Hauck, manager, engineering sales, Crane Co., as the facilities in the field for the initial installation and for subsequent maintenance must be considered in making the choice. There is usually justification for employing several types of joints, and Mr. Hauck illustrates the point by means of an actual example of an isolated industrial power plant which perhaps involved conditions somewhat unusual but by no means abnormal

SELECTING THE right type of joint for each of the varied piping services of a complete plant is not a matter for casual decision, but must reflect adequate study and a background of mechanical judgment.

There is no type of joint for piping which should be used universally. Whether welded, flanged, screwed or otherwise, there is no single type of joint which is the answer to all plant problems or conditions. Usually, the final choice specifies a variety or admixture of joints for the different piping services. Selections should stem from an evaluation of several factors.

Whether selecting the type of joint for a single pipe line or the types of joints for the many lines comprising a complete piping system, the facilities which are available for assembly and erection in the field and the facilities for subsequent maintenance must be taken into account. These two influencing factors must be considered separately, because the facilities which are available for the initial installation may not be present for subsequent maintenance operations.

Plant Location Influences Choice

The location of the plant may limit these facilities. Ask this question: When all of these piping materials reach their ultimate destination, what will happen? Call this "imagineering", if you choose. The point can be amplified by a specific example.

Our example deals with the complete piping system for an industrial power plant for a smelting operation in South America. This plant is remotely located, many miles from any populous center — is truly isolated. Fig. 1 provides an over-all picture of the plant, and Figs. 2 and 3 show its piping.

Fig. 1 is a plot plan of the power plant structures and the major equipment involving the piping. The boiler house contains two waste heat boilers, an emergency boiler feed pump and a steel blowoff tank.

A tunnel approximately 125 ft long contains piping, electrical conduit, etc., and connects the boiler house and the power house.

The power house contains three steam turbine driven units; two are 1250 kw turbo-generators and one is a turbo-blower. There are three motor driven circulating water pumps and two boiler feed pumps (one motor driven, the other turbine driven). The equipment for feedwater comprises a deaerating heater, evaporator, high pressure heater and a roof water storage tank.

To the right of the power house is the cooling tower, which is connected to the circulating water piping for the condensers of the three turbine driven units.

Figs. 2 and 3 are modified isometric drawings of the piping which connects the principal items of equipment. These drawings are not to exact scale and some slight modifications have been made in locations and arrangement in order to improve their clarity.

Fig. 2 shows the pop safety valve escape piping, main steam piping, atmospheric relief piping from the condensers and the extraction steam and exhaust piping.

Fig. 3 shows the high pressure boiler feed discharge piping, boiler feed pump suction piping, suction piping to the emergency boiler feed pump, make-up water to the evaporator and pump suction, condensate piping, circulating water piping and the boiler blowoff piping.

Scrutiny of Figs. 2 and 3 discloses that the assembly and field erection of this complete piping system involves a wide range of pipe sizes, various types of services and several pressure and temperature classes. Adding the complicating fact that the installation took place not only in a distant country but in an isolated location, it is apparent that types of joints had to be selected in keeping with the local facilities for assembly.

It was also important to remember that after the original installation was completed, another consideration might influence the choice of piping joints — the facilities available later for possible maintenance operations.

Facilities for Assembly of the Piping

This project was equipped to cut and thread pipe 4 in. and smaller, to make solder joints, to assemble flanged joints and to perform a limited amount of welding. These same facilities are available for later maintenance of the piping. It was the apparent restriction imposed upon welding which posed a problem in selecting the types of joints to be used.

Considered opinion disclosed the desirability of limiting any welding of piping in the field to low pressure and low temperature services. Any field welding of high pressure and high temperature piping was ruled out because there was no background of experience at this plant in this class of welding and conceivably it could prove inadequate.

The volume of welding which could be accomplished was also limited; hence, the number of welds delegated to the field construction force had to be restricted in order not to impede erection of a more or less extensive piping system.

In order to conform to these limited erection and maintenance facilities, the selection of piping joints was patterned as explained in the following paragraphs.

No Field Welds for High Pressure Lines

The high pressure piping includes main steam piping (415 psi at 750 F), boiler feed discharge piping (500 psi at 230 deg F) and boiler blow-off piping. These three lines of piping were designed to eliminate the need for any welds in the field and to preclude the necessity for any welding in subsequent maintenance work.

All three systems of high pressure piping were completely prefabricated before export shipment, thus permitting the maximum number of welded joints to be employed in the design and still keep within the restrictions set up. All intermediate joints which had to be assembled in the field are flanged. The piping was designed to produce the largest practical assemblies which could be transported by the combination of rail and ocean shipment used. Thus, the number of flanged joints was held to a minimum.

The conditions of pressure and temperature are not severe enough to make the use of flanged joints at all questionable or to create any particular maintenance problems. Flanged end valves were selected primarily to facilitate the possible removal or replacement of valves in future maintenance programs without the necessity of welding.

Minimum Field Welds in Low Pressure Piping

The bulk of the low pressure piping, in sizes 2½ in. and larger, was also prefabricated and designed to produce assemblies in the largest practical sizes which could be transported, thus keeping the number of field welds to a minimum. Further, the over-all design is such that field welding was confined to butt welds. Such butt welds were established in accessible locations; whenever an intermediate joint had to be located close to the building structure or otherwise was not readily accessible, a flanged joint was substituted. Again, the design was patterned to keep within the limitations imposed upon field welding at this particular installation.

The locations of field butt welds are indicated in Figs. 2 and 3 with the letters "FW". The intent and scope of the design, as outlined in

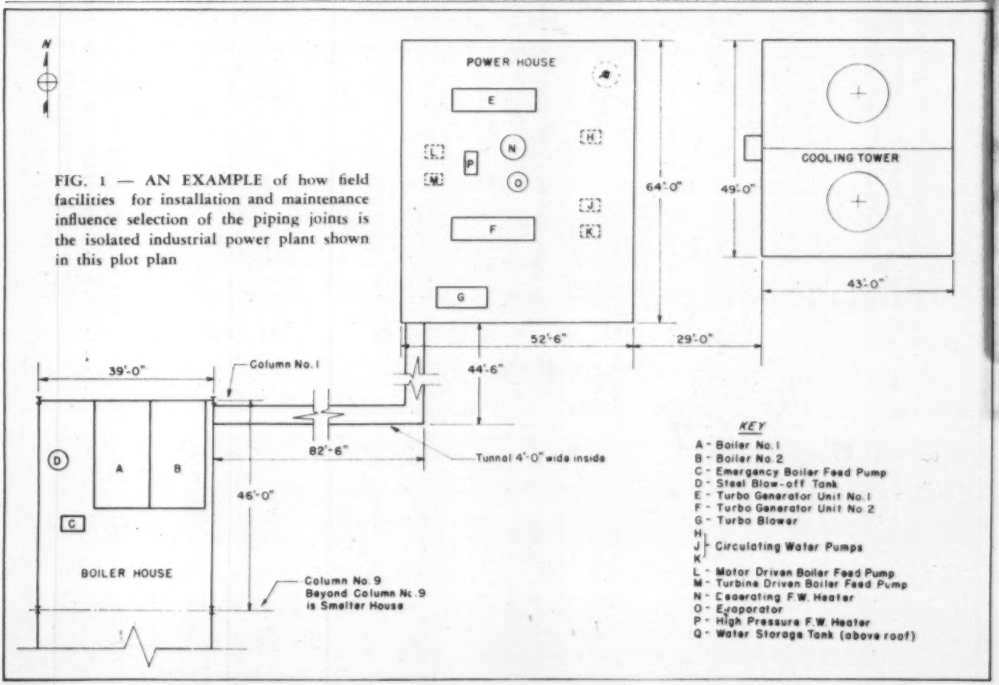


FIG. 1 — AN EXAMPLE of how field facilities for installation and maintenance influence selection of the piping joints is the isolated industrial power plant shown in this plot plan

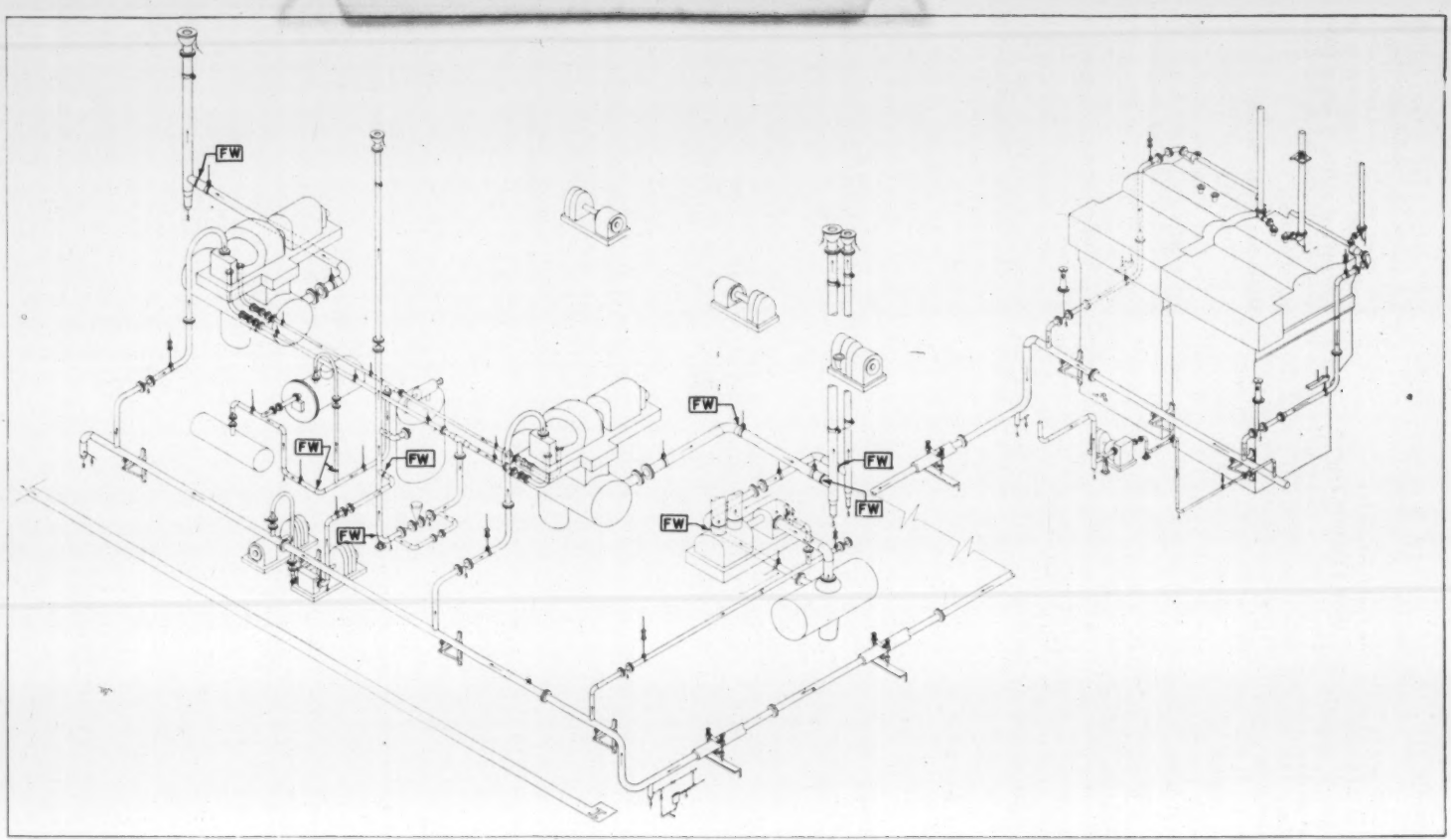


FIG. 2 — MODIFIED ISOMETRIC view of some of the piping at the plant. Drawing has not been reproduced in a size enabling showing the notes and details, but merely to indicate locations of field butt welds (FW)

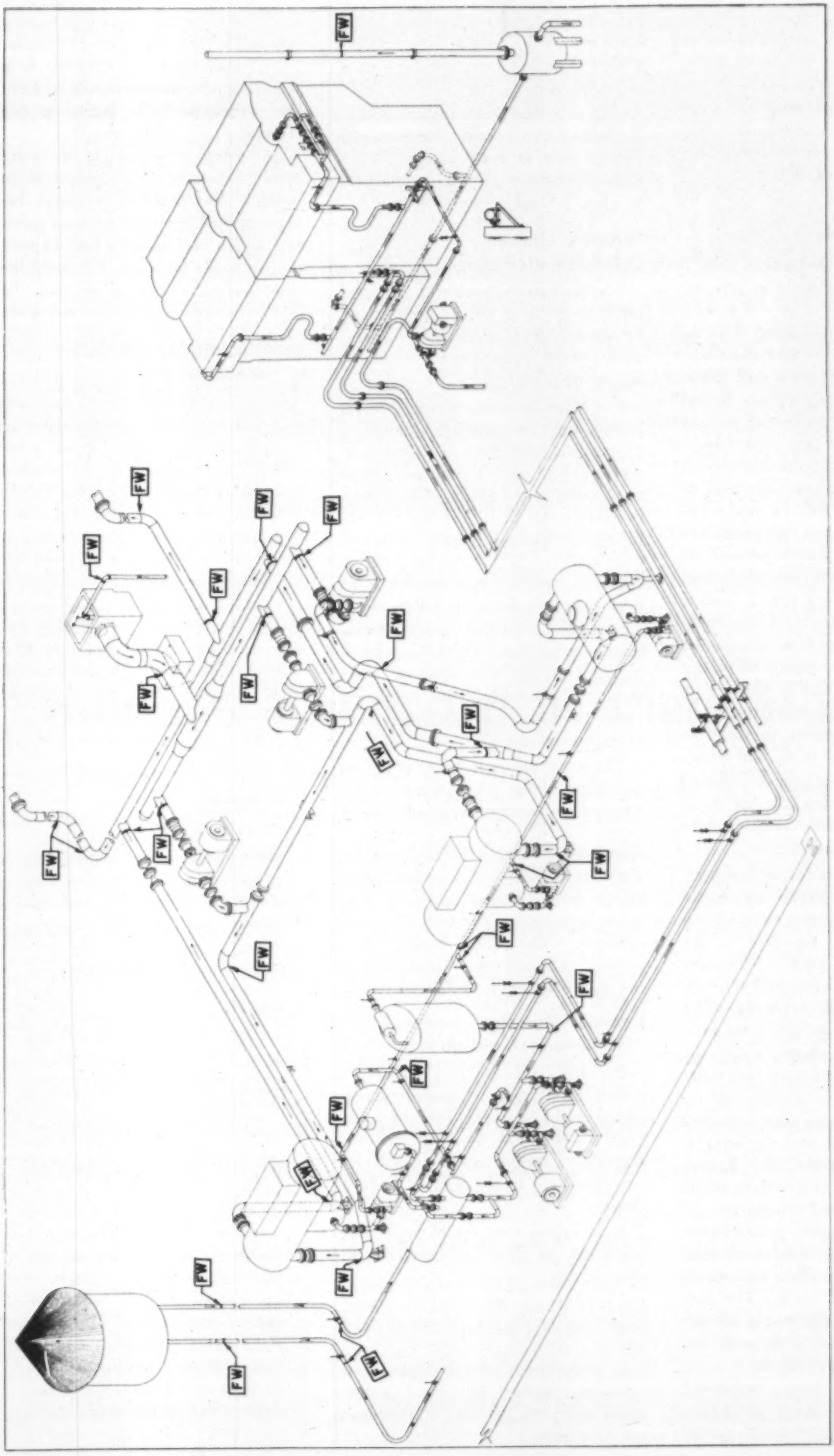


FIG. 3 — ANOTHER MODIFIED ISOMETRIC view of the piping at the plant used as an example. The piping was designed and prefabricated to produce the largest possible assemblies which could be shipped in order to keep the number of field welds (FW) to the minimum

the previous paragraphs, are well exemplified in the system of circulating water piping. All of the bulky headers which contain welded nozzles, eccentric reductions, etc., were shipped as prefabricated units. This entire system was assembled in the field with 17 butt welds.

Selecting Types of Flanged Joints

The selection of the types of flanged joints for the piping took into account several factors.

The prefabricated piping for the main steam and boiler feed discharge lines was produced with full thickness lap joints and 600 lb forged steel lap joint flanges for all flanged joints. Lap joints appeared advantageous for these two lines for several reasons. Assembly and erection of piping sometimes can be made appreciably easier when lap joints are used because the flanges swivel on the pipe. This facilitates alignment of piping, inasmuch as a swivel flange accommodates itself readily to variations in the position of adjacent bolt holes or to the setting of piping at odd or slight angles. There is a marked advantage in a swivel flange if it becomes necessary to install a valve with its stem at an odd angle.

Flanged joints on the prefabricated piping for boiler blowoff were made with 600 lb welding neck flanges butt welded to the pipe.

The flanged joints for all low pressure piping were prefabricated and comprise 150 lb forged steel slip-on flanges, welded to the pipe at the front and at the back. Whenever such a 150 lb steel flange was to be bolted to a 125 lb valve or other equipment having integral cast iron flanges, the normal raised face on the steel flange was eliminated and a flat face was provided.

Flanges throughout the complete piping system and for all services are uniformly forged steel. Except for the lap joints on the main steam and the boiler feed discharge, all prefabricated flanged joints were made with welding flanges so that the flanges would in effect become an integral part of the pipe. The possibility of any maintenance of the joints between the pipe and the flanges was thus eliminated.

The use of steel flanges prevented any breakages in bolting up during erection. Having steel flanges on all prefabricated piping also precluded breakage in the long transit and repeated handlings of the rail-ocean shipment.

The only exception consisted of a few small size forged steel screwed flanges used in making a negligible number of flanged joints in the field for low pressure water lines.

Selecting Joints for Small Piping

The facilities available in the field for both the original installation and for subsequent maintenance likewise governed the selection of joints for the small piping.

For high pressure saturated steam piping, high pressure trap and drip piping, and high pressure instrument piping, all in sizes 1½ in. and smaller, screwed joints were employed in combination with forged steel valves, fittings, unions and flanges. Screwed construction was adopted in order to eliminate welding and inasmuch as it is more than adequate for the service conditions without creating maintenance problems. Further, in keeping with the facilities, screwed joints are more adaptable in the event any valves need be removed for servicing or replacement.

The low pressure instrument piping and some of the oil piping was constructed with solder joint fittings and copper tubing. All other low pressure lines in sizes 2 in. and smaller were assembled with screwed end valves, fittings, unions and pipe. For a few sections of 2½ and 3 in. low pressure water lines, forged steel screwed flanges were utilized in making up a proportion of flanged joints.

Unusual But Not Abnormal Conditions

Perhaps this isolated industrial power plant involved considerations which might be termed somewhat unusual — although by no means abnormal. Parallel situations will occur elsewhere to a lesser or greater degree.

It is hoped that the example has amplified the theme of this article; that is, that

1) There is no type of piping joint which should universally be used;

2) Selection of piping joints is not a casual matter, but must reflect study and a background of mechanical judgment;

3) There is usually justification for employing several types of joints;

4) Facilities in the field for both erection and maintenance should not be overlooked in selecting piping joints.

Accepting these points as valid conclusions may be of assistance in fulfilling the intent of a design because piping materials are then specified which will go together expeditiously in the field and will avoid the complication of being beyond the scope of available facilities and skills.

CONSTRUCTION RECORD IS SMASHED

ANOTHER CONSTRUCTION record was smashed when contracts awarded in the 37 states east of the Rockies for the first six months of 1951 reached an all-time high of $8,808,109,000, according to the F. W. Dodge Corp. —29 percent greater than the nearest comparative total of $6,854,148,000 set during the first half of 1950.

The June figure was $1,408,932,000, compared with the monthly record-smashing May total of over $2.5 billion. The June 1951 total was still high enough to be 5 percent ahead of the total for June a year ago.

"QUOTE"

"It is the consensus among the managerial and supervisory personnel that air conditioning increases the amount and improves the quality of work done. This is especially true where heat and humidity conditions are reasonably severe. Time lost by illness, pollen allergies, and fatigue is reduced and 'dismissed' time is eliminated when offices are air conditioned.

"The scope and general use of air conditioning has, in the last few years, been greatly expanded. The use of air conditioning not only improves working conditions but permits flexibility of design in the disposition of working spaces in new buildings."—*W. E. Reynolds, Commissioner of Public Buildings, General Services Administration, Washington, D.C., in a statement prepared especially for publication in HPAC.*

MAINTENANCE PLAYS important part in tip-top performance of heating equipment. Summer's the time to put unit heaters in shape for next winter's cold waves

Summer Check-Up of Plant Heating Assures Efficiency Next Winter

SPRING AND SUMMER is the time for a thorough "going-over" of a heating system if it is expected to give trouble-free service at top efficiency next winter.

Mechanical equipment will give trouble-free service to the extent that it is properly cared for. Unit heater maintenance isn't complicated. Observance of a few simple rules will insure the satisfactory operation of a unit heating system when the heat is turned on again next fall.

Inspection of Motors is Vital

Remove dirt and grease from motor housings. It is generally recommended that motors be dismantled every third year for a thorough cleaning inside and out.

Follow motor manufacturers' lubricating instructions as covered on tags attached to unit heater motors. On motors requiring lubrication, a word of warning should be heeded — *more motors are damaged by over-lubrication than by under-lubrication.* The method of lubrication is determined by the type of motor. Lubrication is usually recommended after every 2000 hr of operation.

Keep Condenser Clean

Air laden with lint, dust and various types of foreign matter clogs unit heater condensers, reducing heat output . . . often to a serious degree.

Condensers can usually be cleaned without taking units down. Loosen dirt with brush on the side of fins where dirt *enters* the condenser; then turn on unit heater fan to blow the loosened dirt through. A high pressure air hose directed at the fins from the side where the air leaves the condenser is also effective.

By Arthur J. Swartz
Modine Mfg. Co.

Clean Casing to Prevent Rust and Corrosion

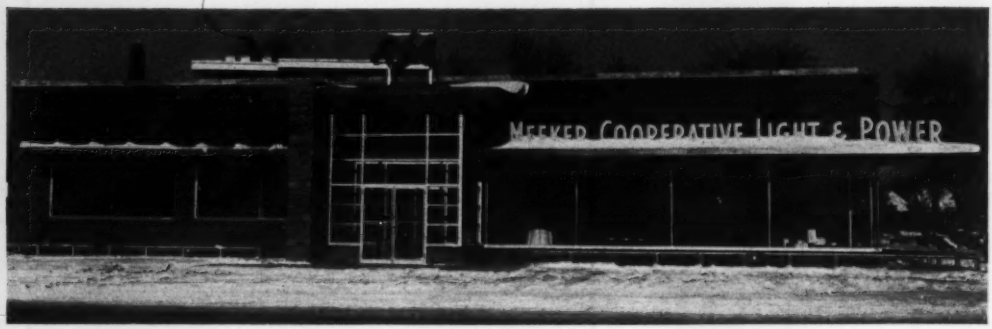
Periodic cleaning of the unit heater casing is recommended to remove dirt, grease and corrosive substances which may prove injurious to the finish. Rusted or corroded spots should be touched up.

Other Points to Check

Fan guards and motor brackets should be tightened. Check fan for clearance, free rotation and firm connection to motor shaft.

Check traps to assure proper elimination of gas and air to prevent corrosion in the unit due to presence of oxygen or carbon diozide in the condensate.

Valves should also be inspected to insure their proper operation.



TEMPERATURES DROP TO AS low as 40 F below zero in Litchfield, Minn., but the REA Meeker County Co-op building is kept comfortable despite large single-pane glass areas by heated air only introduced through the air diffusion panels. Building has no basement, little insulation

Air Distribution Ceiling Panels Eliminate Need for Supplementary Heat

No supplementary heat is used at the REA Meeker County Co-op building, Litchfield, Minn. — where temperatures sometimes drop to 40 below —, all heating, ventilating and cooling requirements being met by air from a seven-zone unit introduced to the space through low velocity, pressure displacement air diffusion panels. Fred F. Lange, of the Mechanical Service Co., Minneapolis, representative of the Multi-Vent Div., Pyle-National Co., Chicago, describes the installation and the results achieved

A NOVEL HEATING, ventilating and cooling installation serving the headquarters of the Meeker County Co-op of the Rural Electrification Administration, Litchfield, Minn., is of particular interest in that all the wintertime heat losses are compensated for by the introduction of air which is distributed uniformly and in proper proportion to meet the demand. No supplementary heating is utilized.

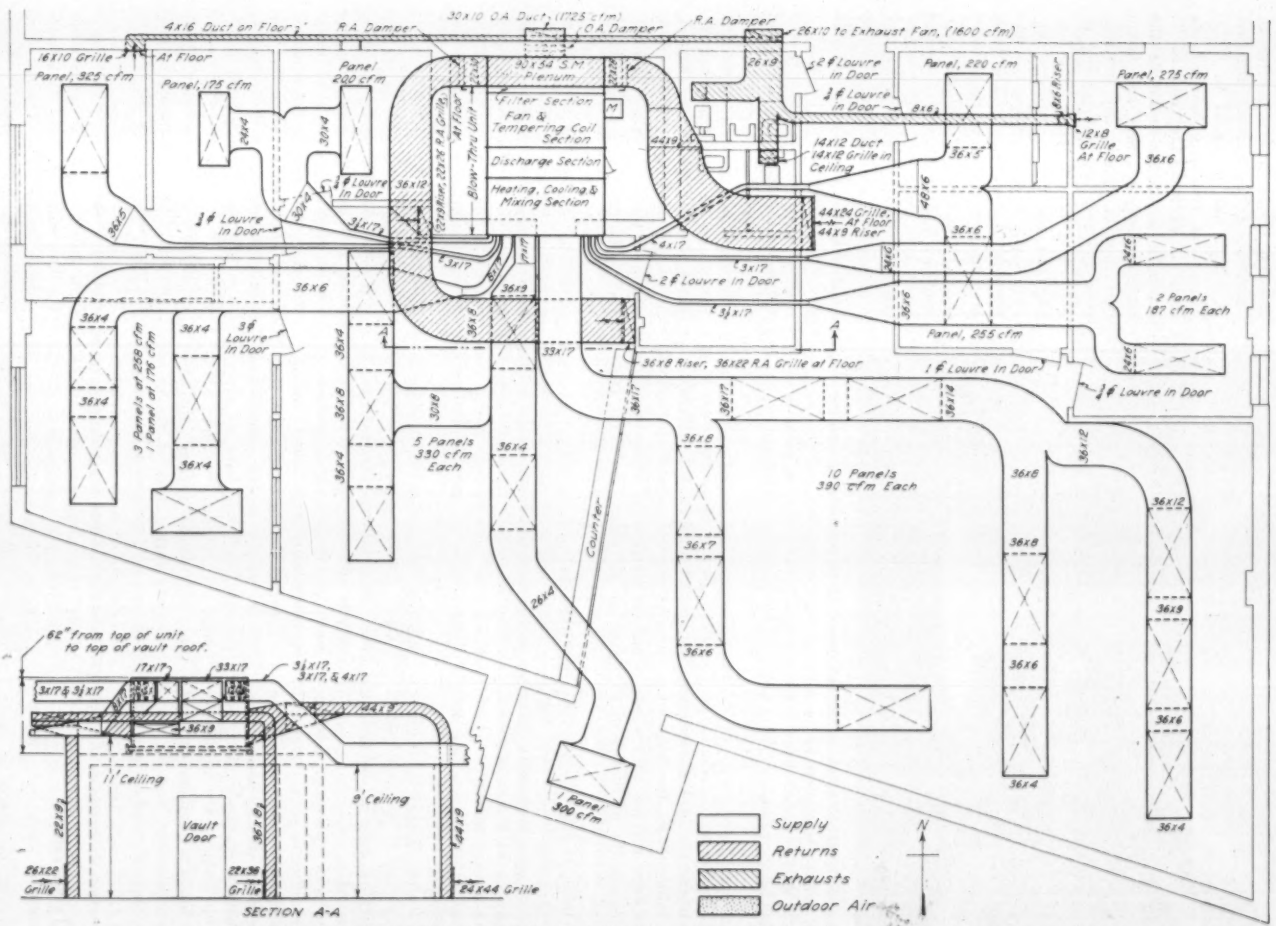
According to the architects and engineers, heating this building entirely by the air introduced through ceiling diffusion panels resulted in an estimated saving in installation cost of some 20 to 30 percent. As the necessary duct work can be constructed of non-metallic materials, the scheme minimizes the use of critical items.

The building — constructed originally for other purposes — is one story, no basement, of concrete block construction. In the fall of 1950, it was completely remodelled for office use; Pfeifer & Shultz, Minneapolis, were the architects and engineers.

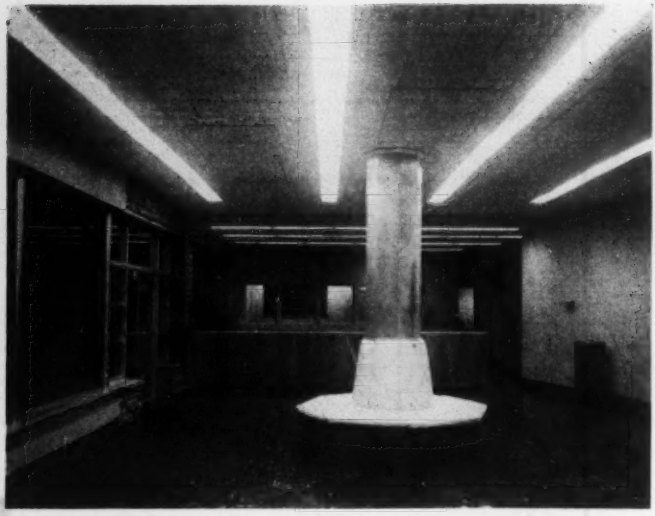
The architects and engineers recommended that the blocks be furred ½ in. and specified that the wall areas be metal lathed and plastered. The ceiling was suspended, and a 3 ft crawl space was left for wiring and duct work. The underside of the roof was insulated with 2 in. bats of glass wool; the concrete floor was covered with asphalt tile.

The heating, ventilating and air cooling system was designed in such a manner that all three functions are accomplished by the use of an air conditioning unit having coils and filter banks on the discharge side of the blowers.

In designing the system for heating, it was of course necessary to consider that temperatures drop to as low as 40 deg below zero, and that sustained temperatures of 15 to 25 deg below zero are not uncommon. Another most important heating factor was that it was decided that the windows would be of ordinary single thickness plate glass. No type of supplementary heat was provided beneath the windows or outer walls. The windows extend almost from the ceiling to the floor, and it is most



HEATING, VENTILATING AND AIR COOLING are accomplished by seven-zone air conditioning unit, each zone thermostat controlling a face and bypass damper within the unit. Coils and filter bank are on discharge side of blowers



AIR DIFFUSION PANELS cover approximately 10 percent of the ceiling area. Since the primary air in winter is at a temperature of from 110 to 125 deg, perforated diffusion plates of panels function to an extent as radiant heating panels

important for the air distribution to compensate for the cold convection currents falling from the windows and dilute these currents with warm air to eliminate the possibility of a "cold zone".

The building is divided into seven zones, each being individually controlled by a zone thermostat. The unit supplying the heated or cooled air is thus a seven zone type. Each zone thermostat controls a face and bypass damper within the unit so that air — either heated, cooled or a mixture of both — is introduced to each individual zone as dictated by its thermostat.

Low velocity, pressure displacement, air diffusion panels are used exclusively for air introduction. The principle of low velocity positive flow of air delivery, blanketing the given space with primary air introduced, has been found to eliminate drafts or uneven temperatures, and the occupants in the office adjacent to the windows are as comfortable as those in the interior of the room.

Small Temperature Differential

The system was placed in operation in the fall of 1950, and with outdoor temperatures as low as minus 40 F during the severe winter of 1950-51, it was found that there was no greater than a 2 F differential between the temperature at the floor and the temperature at the breathing line in all zones, including inner areas as well as those adjacent to exposures.

The air diffusion panels cover approximately 10 percent of the entire ceiling area of the space conditioned. Since the primary air being delivered when on the heating cycle is at a temperature of from 110 to 125 deg, the perforated distribution plates of the panels, warmed to this temperature, function to a certain extent as radiant panels, to assist in bringing about uniformity in temperature from floor to ceiling.

The fact that the occupants of these offices, during severe outside temperature conditions, have not experienced any sensation of coldness about the feet would indicate that the relatively large areas of the panel diffusers are functioning in a manner to bring about a means of compensating for the heat losses through the floor. This installation will probably lead to further investigation of the possibility of a combination panel diffusion unit having the dual purpose of introducing air as well as functioning as either a radiant heating or radiant cooling panel surface.

NEW HANDBOOK OF OIL BURNING PUBLISHED

Handbook of Oil Burning, published by the Oil-Heat Institute of America, Inc., is fifth in a series of handbooks on oil burning, the first of which was published in 1926. The current volume, of which F. H. Faust is editor-in-chief and G. T. Kaufman is editor, represents the work of forty-eight men, and covers the range of present day practice, from the recovery and refining of petroleum, through the properties of fuel oils and the mechanisms that burn them, to the applications and methods of installation. The book presents information of great value to oil burner men in both domestic and industrial fields. It is divided into nine sections, of which the first eight contain fifty-three chapters of text matter, the ninth being devoted to standards, biographies of the authors and editors, and index.

Section 1, in six chapters, discusses petroleum, its production and refining; fuel oil, its physical and chemical properties; competitive fuels; fuel oil distribution and delivery. Section 2, with four chapters, is devoted to combustion. Sections 3 and 4, totaling thirteen chapters, take up burner design and construction. In section 5, eight chapters consider heat transfer and heating systems. Sections 6 and 7, respectively, devote six chapters to controls and six to selection of equipment. Section 8 with its ten chapters presents information on application, installation and maintenance of oil burners

As a whole, the book's nature and text reflect the considerable planning and organization that must have gone into its creation. With such an extensive departmentalization, however, it was probably inevitable that certain inconsistencies and overlapping in the material would — and did — occur. With such an extensive list of authors, it was probably inevitable that differing viewpoints would be expressed, and methods of treatment of subject matter would — and did — differ.

At times, the departmentalization becomes rather puzzling. A 20-page chapter called "The Chemistry of Combustion" is followed by a 4-page chapter called "The Process of Combustion," which in turn is followed

[*Concluded on page 86*]

AFTER *a* FLOOD

Restoring Equipment to Service

It is possible, usually, to wash out the mud from the interior of boilers, piping, tanks, pumps, etc., and thus to restore a measure of cleanliness rather rapidly. It is not possible, however, to remove the water from the brickwork of boiler settings, from the windings of electric generators, motors, and electric control devices without a comparatively long drying process.

Brickwork and concrete saturated with water and then heated quickly will be torn to pieces by the rapid expansion of the water and by the steam. The windings of electric apparatus must be water-free before the usual energy is applied, as otherwise the moisture will short-circuit the windings and burn them out with resultant heavy expense for re-winding. Probably the best procedure is to send the armatures and coils from large motors to an electrical manufacturer's plant where they can be baked dry under controlled temperature conditions, and where they can be proved ready for service without danger of damage. Where large heavy generators have been submerged, it is possible to dry them out in place, using fan-blown heated air, but the process is a tedious one, and the temperature of the air must be limited.

There is some advantage for buildings liable to submergence, in the use of belted small electric motors for fans, pumps and the like, since these usually can be replaced quickly with borrowed temporary substitutes while the original motors are rehabilitated.

Of course any competent custodian will, after a flood, wash out all shaft bearings to be sure that no grit has contaminated the grease. The oil of bearings which use oil, being lighter than water, will have been replaced by dirty water, and of course this must be corrected.

There is nothing to be done about water-soaked boiler masonry except to dry it out very slowly with a small fire.

If the flood came so quickly that the fires could not be drawn and the boilers cooled down, it is advisable, particularly with cast iron boilers, to apprehend cracked castings and other leaks due to the rapid localized contraction following sudden cooling by flood waters. A wise precept no matter what kind of boiler may be in service is to have a standard hydrostatic test and a complete inspection made by the boiler insurance company.

The insulation of the boiler and hot piping will almost assuredly be so compressed and matted as to be useless, if indeed it has not fallen off. The insulation depends on its cellular quality for heat-barring effect, and the cellular quality of most insulation will be destroyed when it is water-soaked. It is quite likely that, even if the insulation is not ruined, the canvas jackets will mildew, and that some process of sterilization of the spores followed by repainting of the canvas will be necessary.

Any tanks which could not be filled when the water rose around them must have exerted a powerful lifting effect and if not torn loose may have strained the pipe connections so that they will leak. Almost any buried fuel oil tank in flooded districts will endeavor to float up with the water, especially if only partly full. It is customary to anchor such tanks with concrete of sufficient weight to hold them down, even though they are empty, and it would be wise, in preparing for a flood, to fill the fuel oil tanks full of oil and to close off the valves so that the uncontaminated oil assuredly will be on hand after the flood is over. The oil will weigh less than the water it displaces, but the oil plus the weight of the tank and that of the superimposed earth probably will overbalance the lift of the water even without a concrete anchorage.

I will never forget watching a big brick cistern floating down the Missouri river during one of the floods of the "Big Muddy." This round cistern evidently was nearly empty when the river washed the earth from around it, and although it was at least 15 ft in diameter it floated along in the stream just as easily as would a jug in a bathtub.

I remember also designing a low-lying boiler room for an institution in a city subject to floods. This boiler room is reinforced and weighted down with watertight walls extending above flood level, so that it simulates a ship's hull run aground when the high water comes.

The technique that we followed in a periodically re-flooded office building on the banks of the Ohio may be of interest. We placed the gas burning boiler on the top story, and heat the third, second and first stories with mechanically circulated hot water.

The frequently inundated basement has unit heaters. When a flood comes, they paddle a boat through the basement and collect the valved-off unit heaters so as to protect the fan motors. They use water transportation when necessary to reach the upper stories and transact business, and are easily heated during chilly weather despite a flood.--Samuel R. Lewis, consulting mechanical engineer. Member of HPAC's board of consulting and contributing editors.

Let's Speed Up the Fan!

How to estimate amount to speed up a fan to correct performance of an air conditioning, ventilating or exhaust system

By Peter Franck
Chief Field Engineer
Armo Cooling and Ventilating Co., Inc.

To SPEED UP the fan is often suggested as a remedy for air conditioning, ventilating and exhaust systems in order to improve the performance of the installation. Then the question arises of how much to speed up the fan, and it is here that lack of information forces some "intelligent guess."

The difficulty lies in the fact that the fan laws are well known, but how the characteristics of the entire system—with ducts, coils and filters—change is usually a matter of conjecture.

Fan Laws Govern Fan Operation

The operation of the fan itself is governed by the fan laws, which state that for increase in fan speed from s_1 to $s_2 = rs_1$ (where r is the ratio of the new speed to the old speed), the air volume will increase from a_1 to $a_2 = ra_1$, the static pressure developed will increase from b_1 to $b_2 = r^2b_1$, and the power required will increase from c_1 to $c_2 = r^3c_1$.

If a straight duct were attached to the fan, the situation would be very simple if the pressure loss, d, due to friction in the duct increased just by the factor r^2. This would then be taken care of by the increased pressure developed by the fan. Reference to the formula for duct friction

$$h_f = f(L/D)(v^2/2g) \quad \ldots\ldots\ldots [1]$$

shows, however, that the friction in the duct varies not only with the square of the velocity, v^2, which is proportional to the factor r^2 but also depends on a friction factor, f. The other terms in the formula (L, the length of the duct; D, its diameter; and g, the acceleration due to gravity) remain constant for a given system.

This friction factor unfortunately varies in a rather complicated manner, since it is influenced by the diameter of the duct, its smoothness, and the range of the air velocities. The friction factor chart, which is shown on page 79 of the 1950

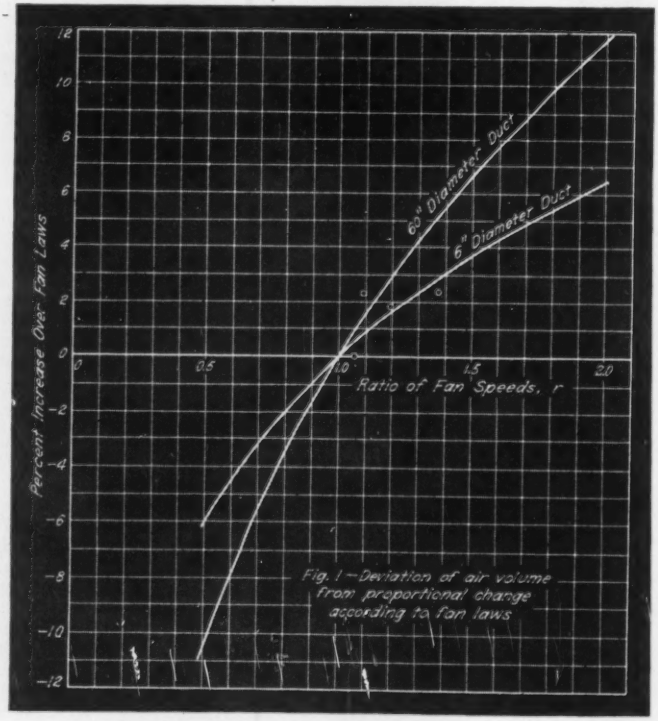


Fig. 1—Deviation of air volume from proportional change according to fan laws

ASHVE Guide, can be greatly simplified, however, if we restrict our investigation to air velocities between 300 and 3000 fpm and galvanized iron ducts with a smoothness factor of 0.0005. The curves of the chart can then be approximated by one straight line for a 6 in. duct and another for a 60 in. duct.

With the help of these simplifications, we can replace the chart by a formula of the type

$$f = h/R^q \quad \ldots\ldots\ldots\ldots\ldots\ldots [2]$$

where h and q are constants for any given duct diameter and R, the Reynolds number, is proportional to the air velocity. For the duct sizes indicated above, we find that the exponent q varies between 0.09 and 0.16. Substituting this value of f in Equation [1], we obtain

$$h_f = kv^{2-q} \quad \ldots\ldots\ldots\ldots\ldots [3]$$

where the constant k converts the Reynolds number into velocity and also includes everything in Equation [1] which remains constant for a given duct.

This simplified friction formula, [3], indicates that the fan performance will not exactly follow the fan laws, but that on speeding up the fan by the factor r the air volume will increase beyond $a_2 = ra_1$. Formula [3] shows that the ratio of the pressure losses in the duct is not

$$d_2/d_1 = r^2 \quad \ldots\ldots\ldots\ldots\ldots [4]$$

which would just balance the increased static pressure developed by the fan, but rather

$$d^*_2/d_1 = r^{2-q} \quad \ldots\ldots\ldots\ldots\ldots [5]$$

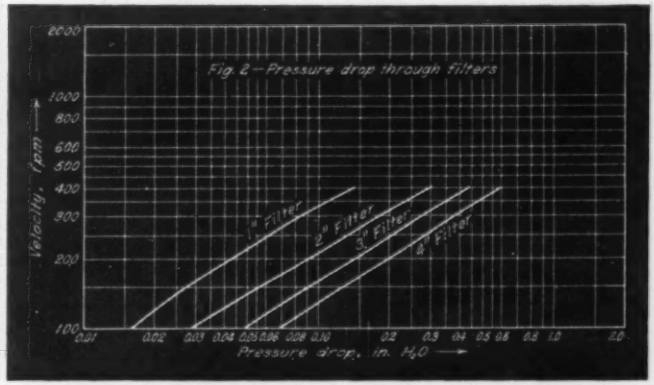
where q lies between 0.09 and 0.16, and d^*_2 denotes the actual new pressure drop in the duct.

In order to evaluate this additional increase in air volume, we assume that the fan will operate at the same efficiency before and after the speed-up (which is a reasonable assumption, since the deviation from the fan laws is small). We find the new actual air volume a^* by equating the power requirement according to the fan laws to the power requirement for the new air volume a^* at the new duct resistance d^*:

$$k_1 r^3 a_1 b_1 = k_1 a^* d^*$$
$$a^* = (a_1 b_1 / d^*) r^3$$
$$= (a_1 b_1 / r^{3-q} d_1) r^3$$
$$a^* = a_1 r^{1+q} \quad \ldots\ldots\ldots\ldots\ldots [6]$$

since, of course, $b_1 = d_1$ for the original system.

To show more clearly the additional percentage increase of the air volume beyond the amount that would be expected from the fan laws,



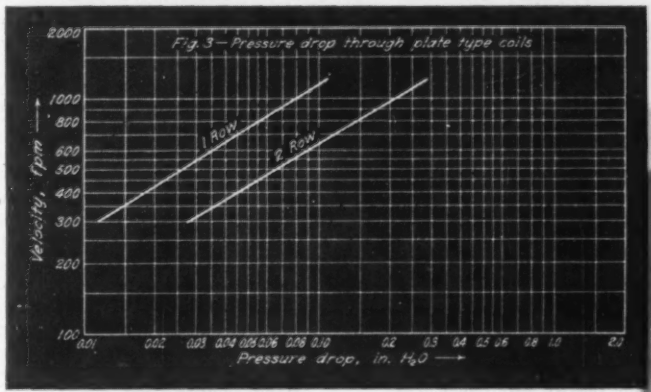


Fig. 1 was constructed according to the formula:

$$\text{Percentage increase} = [(a^* - a_2)/a_2] \times 100 = (r^q - 1) \times 100 \quad \ldots\ldots\ldots\ldots [7]$$

System Comprising Fan and Ducts

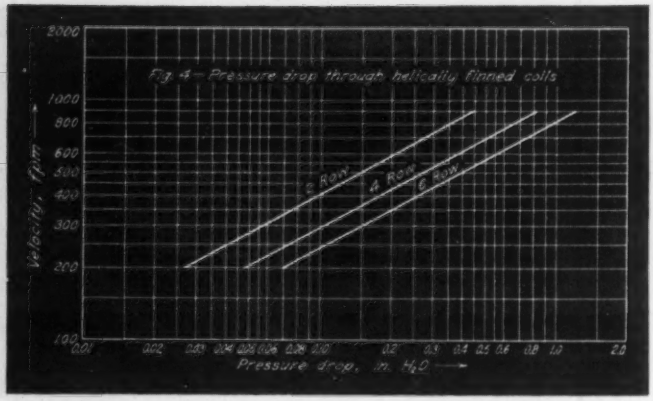
It is obvious that the several branches of an entire duct system can be considered for our purposes as one straight duct of an "equivalent" length. This equivalent straight duct can be determined most easily from the standard duct friction chart. Consequently, the entire discussion above applies to such branch systems.

Similarly, square or straight elbows occurring in the system can just be considered as additional length of straight run; in fact, their resistances are given in the Guide in terms of equivalent length of duct. Our computations are, therefore, equally applicable to the elbows as to the straight portions of the system.

Additional resistance in a duct system is created by changes in direction of flow (shock losses) and by changes in the cross-sectional area of the duct. Both of these resistances are basically shock losses, and the resistance imposed by them varies "substantially as the square of the velocity of the air" (ASHVE Guide). For the purpose of our investigation, then, these losses may be completely disregarded since they are fully compensated for by the standard fan laws.

Resistance of Filters and Coils

In order to investigate the change of resistance through coils and filters with a variation of air velocity the published data for various items of equipment were plotted on logarithmic paper. A straight line on this paper will immediately reveal the important characteristic of the variation of resistance with velocity: the slope of the line (i.e., the tangent of the angle it makes with the positive horizontal axis) is equal to the exponent p of the velocity in the fric-



tion formula of the type given as Equation [3].

$$h_e = k_3 v^p \text{ (k_3 is a constant)} \quad \ldots [8]$$

Fig. 2 shows these lines for throw-away type filters of different thicknesses. Measuring the slope of the lines, we find the following values for p:

For 1 in. filter: 1.61
For 2 in. filter: 1.69
For 3 in. filter: 1.61
For 4 in. filter: 1.60

Notice the resemblance to the friction drops through the straight duct. were $p = 2 - q$, with q lying between 0.09 and 0.16.

Fig. 3 was similarly constructed for plate type coils, and the corresponding values for the exponent of the velocity were found to be:

For one row deep coils: 1.65
For two row deep coils: 1.70

Finally, Fig. 4 shows the same information for helically finned cooling coils of different depths. The values of p are:

For two row deep coils: 1.94
For four row deep coils: 1.89
For six row deep coils: 1.88

Looking at these three sets of curves, we may conclude that the pressure drop through the equipment varies approximately as the drop through the ducts (especially in the item of greatest resistance, the four or six row cooling coils), with a slight tendency toward a smaller increase in pressure drop than the ductwork — which represents the "safe side" as far as the delivered air volume is concerned.

Service Records Check Theory

We have found from the friction formulas in the ASHVE Guide for ductwork and from manufacturers' published data on equipment that the simple application of the fan laws gives "conservative" values for the new air volume when the fan of a system is speeded up. If the fan speed is doubled, for example, Fig. 1 indicates that the air volume may be over 10 percent in excess of the value indicated by the fan laws.

The author was naturally anxious to find an unbiased verification of these findings; fortunately, he found among the service records of his company four different jobs in which readings of the fan speed and the air volume were taken before and after the fan was speeded up. The results are indicated by the points on Fig. 1 — a satisfactory agreement, it is believed, of these routine tests with the theory outlined above.

OIL BURNING —

[*Concluded from page* 82]

by a 21-page chapter called "The Products of Combustion." Then comes a 12-page chapter under the title "Heat Losses and Combustion Efficiency." A total of fifty-seven pages is thus taken to present material which, if written by a single author, could perhaps be done more effectively in half the space.

Another puzzling feature is the almost complete lack of technical or engineering discussion of many important subjects — for example, electric motors. Although a 2-page chapter has been inserted to explain overcurrent protection of single-phase motors, there is nothing said about motors in general, about 3-phase motors and their overload protection, or the complexity of selecting the proper motor for the peculiar requirements of an oil burner. Similarly, little information is presented on oil heaters, and that is scattered through the book. Almost nothing is said of the important class of preheater using boiler water as the heating medium, and the book makes the rather amazing statement that steam is most commonly used as the heating medium. Treatment of subjects of great importance to the man in the field — fireboxes, refractories, wiring diagrams and control circuits — seems either scant or incomplete.

An irritating editorial feature is the obscurity to which the authors have been relegated. Half the value of a technical article lies in knowing who wrote it. The book holds the author to anonymity, unless, like this reviewer, the reader laboriously ploughs through the forty-eight authors' biographies at the end of the book, to glean the name of the author who wrote the chapter under consideration. The place for the author's name is at the head of the chapter he wrote.

As previously mentioned, inconsistencies are bound to occur when a large number of writers tackle a job of this magnitude. Consider an example. From page 75 — "All types of atomizing burners are limited by the viscosity of the oil they can handle, since viscosity directly affects the ease with which the oil can be atomized." From page 227 — "Viscosity . . . does not have a direct bearing on the quality or fineness of atomization. In all probability, the quality of atomization is more dependent upon the hydrodynamic properties cohesion and surface tension."

If one will overlook the contradictions, the overlapping, the varying viewpoints, the seeming emphasis and the many pages devoted to subjects that might better have been omitted completely, the lack of adequate treatment or the omission of subjects of genuine importance to oil burner men; if one makes allowances for the inherent handicaps facing forty-eight men who collaborate on such an undertaking, then the final judgment is that these men produced a good book, which under more favorable circumstances could have been much better.

This 978 page book is available from the publisher at 6 E. 39th St., New York 16. The price is $10 a copy or $16.00 for the morocco-bound edition.—KALMAN STEINER

EQUIVALENT TEMPERATURE

What It Is — How It's Measured

By Thomas Bedford

Unlike the widely known effective temperature chart, the scale of equivalent temperature — which has been used in Great Britain for some years — takes radiant heat into account. Dr. Bedford has prepared this account of the concept of equivalent temperature to explain to HPAC's readers what it means in practical engineering work and how it is measured

IF THE WARMTH of a room is to be completely specified, all four of the factors which make up the thermal environment — the radiation from the surroundings, and the temperature, humidity and speed of movement of the air — must be taken into consideration. From time to time, scales of warmth which take into account two or more of these factors have been prepared. Probably the most widely-known of these is *effective temperature* which, as is well-known, allows for air temperature, humidity and air movement. It makes no specific allowance for radiant heat, however, and in a situation where the mean radiant temperature differs significantly from the air temperature, the effective temperature gives an inaccurate impression of the overall level of warmth.

The scale of *equivalent temperature*, which has been in use in Great Britain for the past 20 years, takes radiant heat into account. Reference was made to this scale in a discussion on man and his environment during the annual meeting of the American Society of Heating and Ventilating Engineers at Philadelphia last January, and an account of the concept of equivalent temperature will doubtless be of interest to many of HPAC's readers.

The author is director of the Medical Research Council's Environmental Hygiene Research Unit, London School of Hygiene and Tropical Medicine, London, England.

Development of Eupatheostat and Eupatheoscope

For the maintenance of a comfortable environment, for the investigation of the heat requirements of rooms, and for the comparison of various methods of heating, a thermostat was needed which would respond to radiant heat as well as to air temperature, and which would be affected by the radiant and convective components of the thermal environment to about the same extent as is the human body. To this end Dufton introduced, in 1929, a thermostatic device which he called the *eupatheostat*. This was a black-painted hollow copper cylinder, 22 in. high and of 7½ in. diameter. It was electrically heated at the rate of 17½ Btu per sq ft of surface per hr, and the surface temperature was maintained at about 75 F, which figure was thought to be the average surface temperature of a person wearing normal clothing when he was comfortably warm. The eupatheostat was sensitive to the radiation from surrounding objects, to sunshine and to drafts, and it kept itself "comfortable" by closely regulating the heating of the room.

Later (1930, 1932), Dufton introduced a similar cylinder, this time called the *eupatheoscope*, or comfort indicator, as an instrument for measuring warmth. The cylinder sat on a wooden stool 28 in. high. It was heated by means of two electric lamps fixed inside it. These lamps were supplied with current through a mercury switch controlled by a bimetallic strip regulator inside the cylinder. When the temperature of the thermostat reached 78 F, the heating current was cut off, and as the thermostat cooled the current was again switched on. When the environment was at 78 F, the temperature of the surface of the cylinder was 78 F, but in cooler environments the surface temperature was below that figure. In a still-air enclosure at 65 F, which was assumed to represent comfort conditions for the average person normally clad, the surface temperature of the eupatheoscope was 75 F, and in still air at 45 F it was 70 F.

In the direct reading form of the instrument, a coil carrying a proportion of the heating current was wound round the bulb of a thermometer, the stem of which was affixed to the outside of the cylinder. Thus the reading of the thermometer depended on the combined effects of convection and radiation. The ther-

mometer was scaled to read in terms of *equivalent temperature*, which was defined as "that temperature of a uniform enclosure, with still air, in which a sizable black body would lose heat at the same rate as that observed."

Humidity is not taken into account by equivalent temperature, and on that account the scale should not be used much beyond 75 F, for at higher temperatures, changes in humidity cease to be immaterial.

As will be mentioned below, the eupatheoscope was later modified, and it is convenient to refer to the instrument just described as the eupatheoscope "Mark I."

Comfort and the Equivalent Temperature

With the increasing use of panel heating in Great Britain, it became apparent nearly 20 years ago that renewed attention should be given to the study of human comfort in relation to the warmth of the surroundings. The writer undertook such a study in a number of factories (Bedford, 1936, 1948). The observations were made during the winter months. The factories were variously warmed by hot water radiators, ceiling panels, hot water pipes (placed in some cases near floor level and in others overhead), gas heated convectors and electrically heated radiant panels. One factory was air conditioned and also had ceiling panels; another was heated solely by closed coke stoves. There were various arrangements of mechanical or natural ventilation.

At each observation position, instrumental measurements of the thermal environment were made while the workers in the immediate neighborhood were questioned as to their thermal comfort. Then measurements were made of the forehead, hand and foot temperatures of these persons and of the mean surface temperatures of their clothed bodies. In all, 3085 sets of observations were made. No observations were made on the workers until at least half an hour after the beginning of the work spell. The instrumental observations included measurements of dry bulb and wet bulb temperatures, air velocity (calculated from readings of silvered kata thermometers), mean radiant temperature (measured directly with a Moll thermopile) and equivalent temperature measured with a "Mark I" eupatheoscope. The globe thermometer (6 in. diameter) was also used, and effective temperatures were ascertained. The range of conditions encountered is shown in Table 1.

TABLE 1 — RANGE OF WARMTH conditions studied

Measurement	Range	Mean
Equivalent temperature	46 to 76 F	62.4 F
Effective temperature	52 to 70 F	60.7 F
Globe thermometer temperature	54 to 76 F	65.6 F
Dry bulb temperature, 4 ft from floor	54 to 76 F	64.4 F
Dry bulb temperature, 6 in. from floor	50 to 72 F	61.9 F
Mean radiant temperature	54 to 80 F	67.1 F
Absolute humidity (vapor pressure)	5 to 14 mm Hg	7.2 mm Hg
Air speed, 4 ft from floor	10 to 100 fpm	31 fpm
Air speed, 6 in. from floor	10 to 110 fpm	31 fpm

Comfort votes were obtained on a seven-point scale and numerical marks were assigned for subsequent statistical computations. About 94 percent of the subjects were women and girls, and nine-tenths of the people were seated at work. All were employed on very light tasks.

It is common experience that there is great diversity of opinion as to what constitutes comfortable warmth, and the literature on heating, ventilation and air conditioning abounds with amusing examples of this. Such diversity was a notable feature of the results of this inquiry. Although the optimum range of air temperature appeared to be from 64 to 66 F, within that range some people felt too warm and others too cold. Because of this diversity, the association between comfort votes and warmth measurements was not very close. The zero-order correlation coefficients are shown in Table 2.

The four coefficients of Table 2 do not differ markedly from each other, yet it is interesting to note that equivalent temperature gave the highest coefficient, while the coefficients for air temperature and effective temperature were identical. The difference (0.04) between the coefficient of comfort with equivalent temperature and that with effective temperature is very nearly three times the probable error of the difference (0.014) and it is therefore reasonable to conclude that feelings of warmth were more closely related to equivalent temperature than to effective temperature.

Equivalent temperature takes no cognizance of atmospheric humidity, but at the room temperatures encountered (Table 1) humidity exerts only a small effect on one's feelings of warmth. In these observations, for example, the combination of a relative humidity of 50 percent with air and walls at 69 F and an air speed of 16 fpm was equivalent, in terms of warmth sensations, to a relative humidity of 32 percent with air and walls at 70 F and the same air speed. A change of 1 F in the temperature of the enclosure was equivalent to a shift of 18 percent in the relative humidity.

TABLE 2 — CORRELATION between comfort votes and warmth measurements

Comfort votes correlated with	Correlation coefficient (r)
Equivalent temperature	0.52 ± 0.01
Globe thermometer reading	0.51 ± 0.01
Effective temperature	0.48 ± 0.01
Air temperature, dry bulb	0.48 ± 0.01

For these British subjects, the comfort zone—in which not less than 70 percent of the persons questioned were entirely "comfortable" — was 57 to 63 F in terms of effective temperature, 58 to 66 F equivalent temperature, or 60 to 68 F dry bulb temperature.

Modified Eupatheoscope Is Developed

It has been mentioned that the surface temperature of the "Mark I" eupatheoscope varied by only 8 F — from 78 to 70 F — as the room temperature declined from 78 to 45 F. The surface temperature of the clothed human body varies much more than that. In a series of more than 2500 observations made by the author, the surface temperature of the body (t_b), expressed in terms of the air temperature (t_a) and the mean radiant temperature (t_w), was given by the equation

$$t_b = 0.399\ t_a + 0.363\ t_w + 25.76 \quad \ldots\ldots[1]$$

so that the surface temperature changed by 0.76 F for a change of 1 F in the temperature of the environment. These observations, by the way, were made at an average air speed of about 30 fpm.

Neglecting any specific allowance for radiation and expressing body surface temperature in terms of air temperature only, the equation was

$$t_b = 0.69\ t_a + 31.0 \quad \ldots\ldots[2]$$

which can be written

$$t_b - t_a = 0.31\ (100 - t_a) \quad \ldots.[3]$$

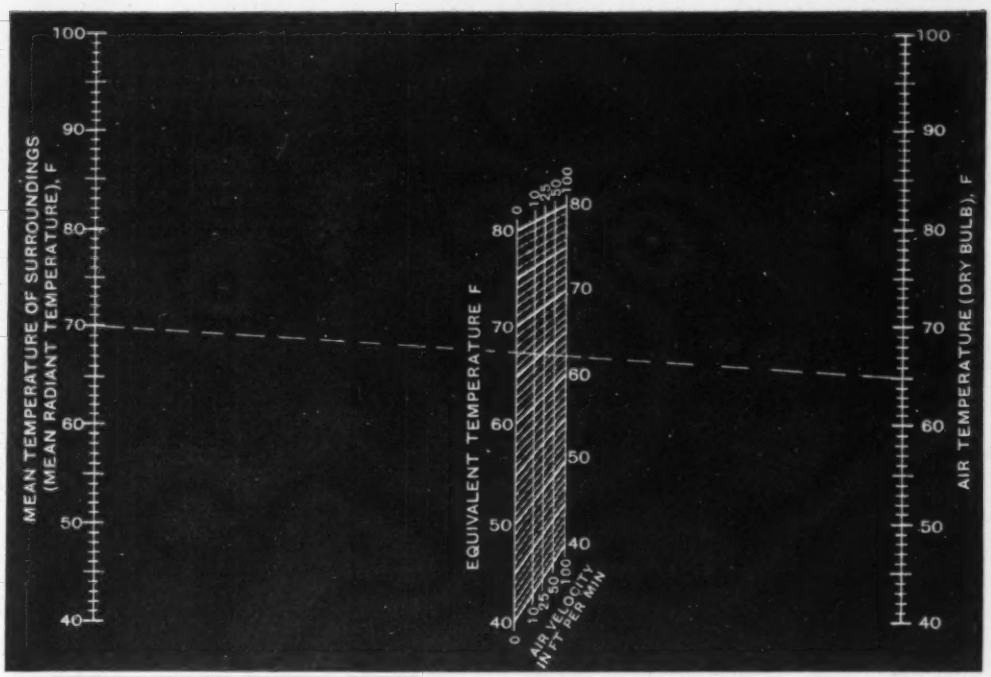


FIG. 1 — CHART FOR ESTIMATING equivalent temperature, based on comfort votes of persons normally clad and doing sedentary or very light work. (Bedford, 1936—courtesy of His Majesty's Stationery Office)

When plotted, the curve for Equation 2 lies very close to that for Equation 1, so that in a fairly uniform environment allowance for the variation in body surface temperature can be made by using the difference $(100-t_a)$; the convection loss can be taken as proportional to the difference between 100 F and the air temperature.

At a room temperature of 65 F, the surface temperatures of the body and of the eupatheoscope ("Mark I") are both approximately 75 F, so that a given change in air movement will affect the two about equally. At a room temperature of 75 F, however, the temperature of the eupatheoscope would be rather less than 78 F, while that of the clothed body would be about 83 F. Thus, although for the indoor temperatures commonly met with in Great Britain during winter, the "Mark I" eupatheoscope could give satisfactory results, for warmer conditions such as those that commonly prevail in American buildings, for instance, it was unsuitable. Because of that Willard, Kratz and Fahnestock constructed (1933) a eupatheoscope with a surface temperature of 83 F.

The data on body surface temperature suggested that for the eupatheoscope to be suitable for general application, and to avoid confusion due to a multiplicity of scales, its temperature should change by about 0.7 F for a change of 1 F in the temperature of the enclosure.

A modified instrument which met this requirement almost exactly had already been constructed by Dufton in 1932, and was described to an official committee in the following year. This instrument was later adopted by the British Inter-Departmental Committee on Heating and Ventilation Research as the eupatheoscope "Mark II," and described by Dufton in a paper published in 1936. The definition of equivalent temperature was changed to: "That temperature of a uniform enclosure in which, in still air, a black body of sufficient size would lose heat at the same rate as in the environment, the surface temperature of the body being one-third of the way between the temperature of the enclosure and 100 F."

Calculating the Equivalent Temperature

For the direct and accurate measurement of equivalent temperature, a eupatheoscope is needed, but from the data obtained by the author's investigation, an equation was derived from which the equivalent temperature can be estimated, with sufficient accuracy for practical purposes, when the component thermal factors are known. It is:

$$\text{Equivalent temperature} = 0.522\ t_a + 0.478\ t_w - 0.01474\ (v)^{\frac{1}{2}}\ (100 - t_a) \quad \ldots[4]$$

where t_a and t_w are the air temperature and the mean radiant temperature (F) respectively, and v is the air speed, fpm.

A nomogram drawn from Equation 4 is shown as Fig. 1. In using the chart, a line is drawn between the points on the left and right scales, respectively representing the observed mean radiant temperature and

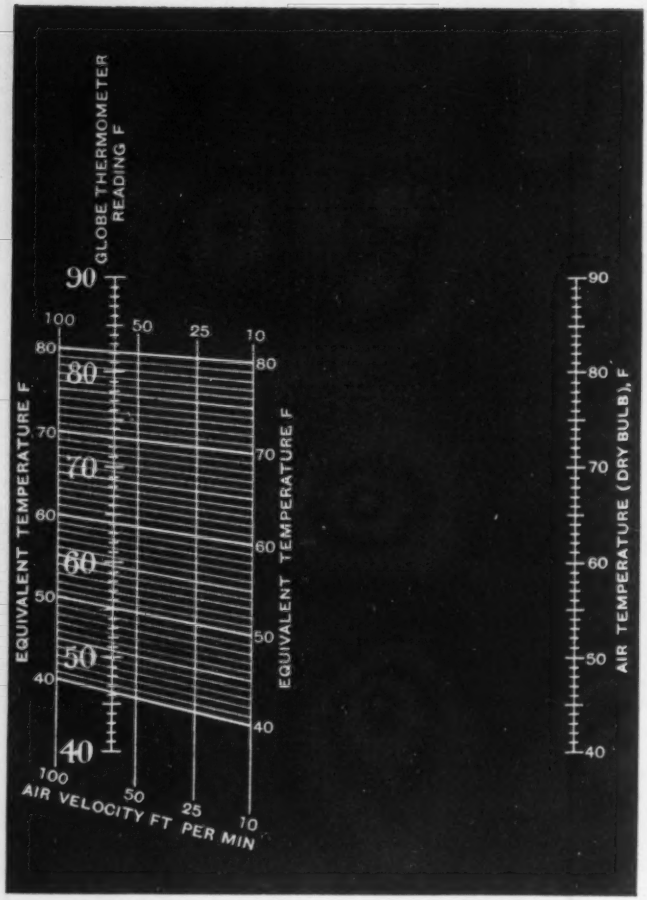


FIG. 2 — ESTIMATING EQUIVALENT temperature (on basis of comfort votes) from globe thermometer readings (Bedford, 1936 — courtesy of His Majesty's Stationery Office)

the air temperature, and where the line cuts the appropriate air velocity line on the central grid, the equivalent temperature is indicated. Thus, the broken line on the chart shows that with a mean radiant temperature of 70 F and an air temperature of 65 F, the equivalent temperature is 65.8 F when the air speed is only 10 fpm and 62.2 F when it is 100 fpm.

The direct measurement of the mean radiant temperature — an expression of the flux of radiant energy at a given observation point —is most conveniently done with a radiation thermopile. Such an instrument is not always readily available, however, and in these circumstances the mean radiant temperature is readily estimated from readings of the black globe thermometer (Bedford, and Warner, 1934) if the temperature and velocity of the air are also known. This use of the globe thermometer was recognized by the ASHVE technical advisory committee on instruments in 1942.

When observations have been made with a 6 in. diameter globe thermometer, the equivalent temperature can be estimated without performing the intermediate computation of mean radiant temperature, by using the relationship

$$\text{Equivalent temperature } (v) = 0.522\, t_a + 0.478\, t_g + (0.0808\, t_g - 0.0661\, t_a - 1.474) \quad \ldots\ldots\ldots\ldots [5]$$

where t_g is the temperature indicated by the 6 in. globe thermometer.

Fig. 2 gives a chart drawn from Equation 5. One draws a line between the points representing globe thermometer temperature and air temperature, producing it to the left if necessary, and reads off the equivalent temperature corresponding to the observed air velocity.

Dufton himself has advocated other methods for estimating equivalent temperature when a eupatheoscope is not available. In 1933 he proposed the use of two specially-made kata thermometers, one blackened and the other silvered. Later (Building Research Board, 1938) he has advocated the use of an "Aitken" thermometer (i.e., a metal cylinder 12 in. long and 4 in. in diameter, holding a thermometer with its bulb enclosed within the cylinder) together with a kata thermometer. With these methods, one does not measure the individual components of the thermal environment, and that appears to be a disadvantage. In the League of Nations report on the hygiene of environmental conditions in dwellings (1937) it was emphasized that in all research studies of such conditions it is of great importance to make an accurate record of each of the four independent thermal factors. The author subscribed to that view in 1937, and still does.

Equivalent Temperature An Excellent Scale

There seems to be no doubt that for normal indoor conditions in Great Britain, equivalent temperature is an excellent scale of warmth. It is valid up to temperatures at which evaporative losses from the body assume importance, and it is likely to be applicable to the conditions encountered in many American buildings. This view is supported by the findings of Rowley and his colleagues (1947), for their data suggested that the feelings of warmth of their subjects, at dry bulb temperatures of 70 to 80 F, and effective temperatures of about 65 to 75 F, were more closely related to dry bulb temperature than to effective temperature. No influence of relative humidity was observed.

Adjusting for Radiation Effects

For the assessment of warmth at levels of temperature at which humidity must be taken into account,

there is urgent need for a revised scale of warmth. The author has suggested, as an interim measure, a method of adjusting effective temperature for radiation effects (Bedford, 1946). The method employed is the use of globe thermometer temperature instead of dry bulb temperature in deriving the effective temperature from the standard chart. It is admittedly a rough-and-ready method, but from the slender evidence available it seems that the adjustment is a reasonable one (Bedford, 1948, pp. 340-343). However, wartime work (e.g., Eichna *et al*, 1945) showed that at conditions approaching the limit of human endurance, the effective temperature scale exaggerates the importance of dry bulb temperature and underrates the overriding importance of wet bulb temperature, and correction for radiation cannot compensate for this shortcoming. Further research on this problem is clearly needed — difficult though it may be.

Triple-Filtered Air for New Building

THE NEW OFFICE building recently completed by the American Air Filter Co., Louisville, Ky., can lay claim to having some of the cleanest air of any similar building in the country. Three types of air filters, installed in series, are used in the air conditioning systems. Outside air is filtered through automatic viscous filters, automatic electronic precipitators and dry type units. Recirculated air bypasses the automatic viscous filters but is cleaned by the other two.

The reason for this triple filtration is to protect the building interior when new models or designs are tested in the system and also to display the various types of the company's filters and precipitators in actual operation.

The air conditioning is divided into two systems — one serving the front or south side of the building and the other the north side. The "south" plenum chamber is constructed of glazed tile — instead of the usual sheet metal — with plate glass windows on the aisle side. Flush ceiling type fluorescent lights permit viewing the equipment from outside. This system adjoins the exhibition space where show models of all of the company's products are displayed.

An air conditioning system comprising room units, each with individual control of temperature, with air supplied from the central station apparatus, is used in the new building. The heating coils and mixing dampers are enclosed in unit ventilator cabinets, which are another of the company's products. A thermostat in each office permits individually controlled temperatures to suit the occupant. Humidistats at various points in the building control the moisture content of the air.

The executive wing of the building, which includes the directors' room, library and the offices of the company's officers, is paneled in matched grain walnut. The sales, advertising and export departments are on the second floor; administrative, purchasing and accounting are on the first floor.

The new building was designed and built by the Austin Co., with Ronald and Associates, Louisville, the heating and air conditioning engineers.

OBSERVATION WINDOWS in glazed tile plenum chamber in new American Air Filter Co. office building show, left to right, the air intake (behind column), automatic viscous filter, electronic precipitator, dry type filters, cooling coils and sprays. This plenum chamber adjoins exhibition space, where models of company's products are displayed

INTERCHANGEABILITY OF FUEL GASES

WHEN GAS burning equipment has been adjusted for gas of one composition, flame characteristics will generally change if another kind of gas is substituted. While some substitutions will be entirely satisfactory, others will result in dangerous or unsatisfactory operation. For example, flames may go out or carbon monoxide may be liberated. Because city gas systems must sometimes change from one source of supply to another, or must temporarily supplement their primary source to meet unusual conditions, it is important to be able to predict the effect of a proposed change. . . . . Elmer R. Weaver, of the National Bureau of Standards gas chemistry laboratory, has recently formulated a new method for predicting the extent to which different gases will depart from exact interchangeability. Using six "indexes", four of them new and all easily computed from the gas composition, the NBS-Weaver gas interchangeability prediction method appears to be more accurate than any method hitherto proposed, is described fully in a report entitled Formulas and Graphs for Representing the Interchangeability of Fuel Gases, by Elmer R. Weaver, published in J. Research NBS 46,213 (1951) RP 2193.

Air Sanitation Important Aspect of Industrial Health Promotion

Allen D. Brandt, Past President of American Industrial Hygiene Association and Chief Industrial Hygiene Engineer. Bethlehem Steel Co., summarizes the Conference on Industrial Health which attracted over 2000 to Atlantic City

AS HAS BEEN THE custom in recent years, five allied organizations active in industrial health work met jointly for the annual Conference on Industrial Health held in Atlantic City in April.

These five groups are the American Industrial Hygiene Association, the American Conference of Governmental Industrial Hygienists, the American Association of Industrial Physicians and Surgeons, the American Association of Industrial Nurses and the American Association of Industrial Dentists. In addition, two more recent industrial health groups held meetings during this same week. They are the U. S. Naval Industrial Health organization and the Conference of Industrial Health Personnel of the U. S. Atomic Energy Commission.

Over 2000 members and guests attended this conference, which of necessity had many of the characteristics of a three-ring circus because of the concurrence of meetings. Not all associations meeting jointly held sessions throughout the entire week but there was considerable overlapping.

Air Sanitation an Important Aspect

Since one of the most important aspects of industrial health promotion is air sanitation, a substantial number of the papers presented at the meetings of the AIHA and the ACGIH are of considerable interest to industrial heating, ventilating and air conditioning engineers. Some of these had to do with the control of air contaminants and others with the influence of the airborne contaminants on exposed persons. A very brief summary of the more important papers follows.

Dr. Leonard Greenburg, executive director of the New York State Division of Industrial Hygiene and Safety Standards showed in a paper on Previewing New Construction what can be accomplished by way of preventing safety and health hazards through the examination and approval of plans for all new industrial construction in a state. Not only does such procedure avoid many health and safety hazards which otherwise would originate, but it serves also to guide and assist many industries in accomplishing the desired result at minimum cost.

Dr. F. S. Vintinner, director of the New Hampshire Division of Industrial Hygiene, in a paper on the Effect of Coal Dust and Smoke on the Lungs with Special Reference to Susceptibility to Pneumonia, pointed out that his findings do not indicate any increased susceptibility to lobar pneumonia of animals exposed to coal dust over control animals.

The first technical session of the AIHA was devoted largely to maintaining clean air in industry. The lead paper was on Recirculation of Cleaned Air from Cast Iron Machining. It was presented by Robert A. Avery, dust control engineer with the American Air Filter Co., and showed how the dust and fine metal removed by local exhaust systems from cast iron machining operations can be separated effectively from the exhausted air, permitting the air to be returned to the workroom.

In a paper on the Design of Exhaust Hoods for Hot Processes, W. C. L. Hemeon, of the Industrial Hygiene Foundation, reduced the considerations involved to their fundamentals in an effort to point the way to a scientific approach to this vexing problem. Most hoods at hot processes are designed by some rule of thumb or on the basis of past experience, and the results accomplished leave much to be desired — as most industrial ventilating engineers know. If the air flow toward the hood created by the heat of the process can be calculated with a fair degree of accuracy, the hood design calculations and fan selection are simplified and much better control will result than has been the experience to date.

Kenneth W. Nelson, of the American Smelting and Refining Co., showed how dust produced in materials handling operations can be controlled by proper water sprays. His paper was entitled Control of Dust by Water Mists and it served to give renewed courage and hope to the many engineers who are faced with problems of dust control at solid materials handling operations but whose past experience with water sprays has been unsuccessful.

Performance of Commercial Dust and Fume Collectors was discussed by Richard Dennis, Harvard School of Public Health. The research of recent years into the fundamentals governing the operation and functioning of conventional dust collec-

tors, especially the cyclone, has removed most of the unknowns in this matter. It is hoped that research of this kind will continue so that the selection of collectors may become more a science and less a painful art.

Edwin C. Hyatt, of the Los Alamos Scientific Laboratory, gave a paper on Exhaust Ventilation on Machine Tools Used on Materials of High Toxicity. The greater toxicity of many of the materials handled by the Atomic Energy Commission requires much more effective control than do many other substances normally handled in industry. Mr. Hyatt showed how local exhaust systems can be designed for and used at machining operations to prevent the escape of any of the material being processed. Even though most of us do not encounter similar specific problems, the ideas and procedures outlined are applicable to other problems where more effective control is needed.

A paper on the Effect of Central Vacuum Cleaning on Airborne Dust Concentrations was presented by Knowlton J. Caplan, industrial hygiene engineer, Mallinckrodt Chemical Co. The installation and use of a central vacuum cleaning system reduced dust concentrations tremendously in a plant where dry chemical powders are handled. This report by Mr. Caplan is very timely because many industrial departments are installing and using such equipment with apparently good results. More facts and figures comparing before and after performance, as given in this paper, are needed.

Other papers of lesser interest to many readers of this journal but of importance in the field of air sanitation included:

1) Efficiency of Filter Paper Air Sampling at Microgram Levels, by W. B. Harris et al, Atomic Energy Commission.

2) An Oscillating Thermal Precipitator, by S. H. Laskin, University of Rochester.

3) Determination of Free Silica by Means of Dispersion Staining and Phase Microscopy, by Germain Crossman, Bausch & Lomb Optical Co.

4) Studies on the Toxicity of Sulfuric Acid Mist, by M. O. Amdur et al, Harvard School of Public Health.

5) A Study of Exposure to Benzidine and Substituted Benzidines in a Chemical Plant, by J. W. Meigs and R. M. Brown, Yale University.

6) Radiation Exposure from Television Tubes, by W. W. Cox, Sylvania Electric Products, Inc.

7) Reduction of Sulfuric Acid Fumes, by L. L. Falk, duPont.

8) Meteorological Factors in Atmospheric Pollution Problems, by M. E. Smith, Brookhaven National Laboratory.

9) The Development of Research on Atmospheric Pollution Problems in Prototype, by G. Strom and W. T. Ingram, New York University.

ONE BIG PUMP OR FOUR SMALL ONES?

You are invited to answer the following question for publication. Please address your reply to the Editor, Heating, Piping & Air Conditioning, 6 N. Michigan Ave., Chicago 2.

"I am a member of a church building committee. Our new church is to be heated by a radiant panel system. There will be four zones.

"Because of space considerations, it has been suggested that we use one large rather than four small circulating pumps for this zoned heating system.

"I would like to know which is better practice, and some of the reasons why — or why not — one pump should be used instead of four smaller ones.

"If this is a question that can only be answered for a particular case or set of circumstances, I'd be interested in some comment on examples where several small pumps were used and on other installations where one larger pump was the choice."—E. R.

INSTALLED IN TRANSOM over entrance, 1 ton window room air conditioner solves problem of small jewelry store in Pittsburgh where there was no space for other equipment, water supply or drainage facilities. Without cooling, store was a "bake oven" in summer, and dust accumulated on instruments and gages when door was left open. Olsen Co. installed the unit. (Photo courtesy Frigidaire Div., General Motors Corp.)

Theodore Hatch Gets Cummings Award

Theodore Hatch, of the University of Pittsburgh School of Public Health, was the recipient of the Cummings award for outstanding contribution to the field of industrial hygiene. This award was presented by the AIHA president at its annual banquet-meeting at which time Professor Hatch delivered the Cummings memorial lecture on Objectives, Principles and Practices of Industrial Hygiene.

This was probably the most successful Conference on Industrial Health ever held. The technical sessions were singularly excellent and the interest, enthusiasm and attendance were outstanding.

The next annual meeting will be at Cincinnati in April 1952, where one full-day session will be devoted exclusively to the engineering aspects of industrial hygiene. Many papers on the different facets of industrial ventilation will be presented at that time.

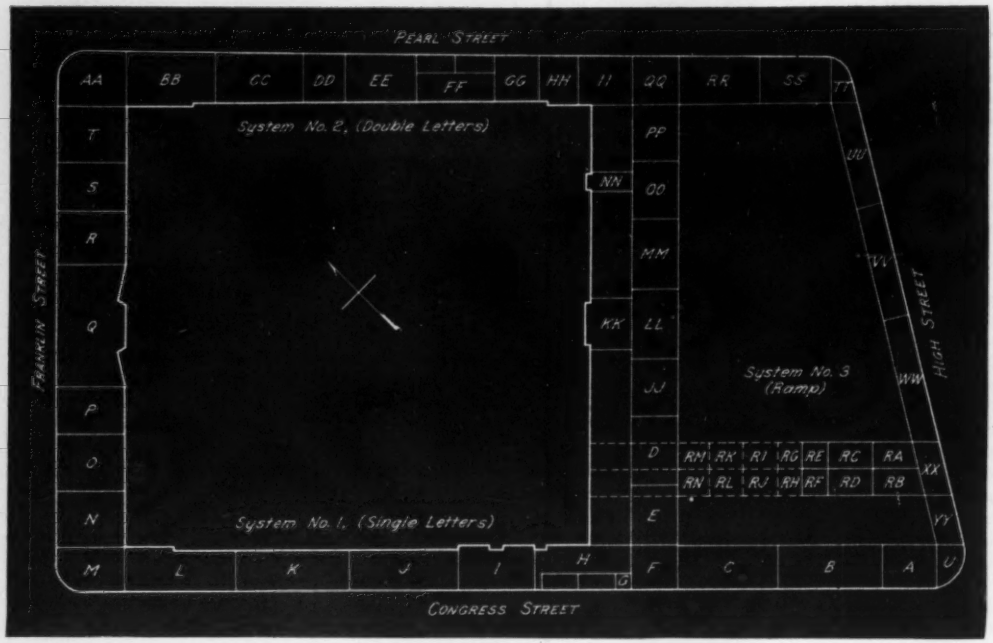


FIG. 1 — SNOW MELTING LAYOUT at New England Telephone & Telegraph Co., Boston. The thermostatic bulb control for the three systems is at the corner of Franklin and Congress Sts. (lower left corner)

Here's Experience Report on BIG SNOW MELTING SYSTEM

Rachel Goetchius Interviews New England Telephone & Telegraph Co., Boston, Summarizes Results of Sidewalk, Driveway and Ramp Melting

THE SNOW MELTING system at the New England Telephone & Telegraph Co., which serves the sidewalks, driveway and ramp, is one of the largest in Boston.

There are actually three separate systems, as indicated in Fig. 1. The first one has 15,000 sq ft of heated area. The heat exchanger, with a capacity of 4,000,000 Btu per hr, is supplied with steam, which is generated by the company, at 4 lb per sq in. The pump has a capacity of 200 gpm. The whole system holds about 1500 gal of solution. The supply temperature is 195 F while the return temperature is 175 F.

The second system takes care of an area of about 12,000 sq ft. The heat exchanger has a capacity of 3,500,000 Btu per hr, while the pump has a capacity of 200 gpm. The average supply temperature is 180 F and the return temperature is 165 F. The capacity of the whole system is about 1200 gal.

The third system, with an area of 3000 sq ft, heats the ramp to the garage in the basement. The heat exchanger has a capacity of 1,600,000 Btu per hr, while the pump has a capacity of 83 gpm. The supply temperature is 160 F and the return temperature is 130 F.

Miss Goetchius submitted an extensive thesis on snow melting to Massachusetts Institute of Technology in partial fulfillment of the requirements for the degree of bachelor of general engineering. This article is one part of her thesis. Russell Wood, building engineer, New England Telephone & Telegraph Co., furnished her the data.

In all three systems, wrought iron pipes are laid in grids with 2 in. headers and 1¼ in. laterals, 18 in. on centers. All connections are welded. Except in the ramp and driveway, the pipes are in crushed stone with a poured concrete slab above. The solution is a mixture of 61 percent water and 39 percent antifreeze. All equipment is in the sub-basement, with mains running up to the basement ceiling and passing through the building at intervals. Just outside the building there are butterfly valves on the return lines to regulate the flow of the solution. Inside the building are the shutoff valves.

Suggestions for Improving Results

Some of the problems and suggestions of the operators of this system are as follows:

1) Some trouble has been experienced because the antifreeze used causes a deposit in the heat exchanger, thus reducing the heat transfer and requiring frequent cleaning of the equipment. This cleaning process is difficult because of the U-shaped tubes in the exchanger.

2) Because the pipe grids do not cross the concrete expansion joints and because of the arrangement of the concrete slabs and these joints, some of the grid sections have a ratio of header to lateral lengths greater than one. Experience with this installation has shown that a ratio equal to or less than one would result in better circulation in the coils.

3) Better results and quicker response are obtained in the driveway and ramp where the pipes are actually in the concrete slab. The pipes were originally put in the stone because it is thus easier to tear up the sidewalk and make repairs without damaging the coils.

4) For economy reasons the laterals were spaced 18 in. on centers. However, in any future installations the owner would prefer where possible to use 1 in. pipe, 10 to 12 in. OC, to obtain better snow melting results.

5) A feature of this installation is the thermostatic bulb control set in the slab outside the building to control all three systems. Whenever the actual slab temperature goes below a set temperature reading, the pumps begin to circulate the heated solution. The bulb was placed in the grid near the building on the corner of Franklin and Congress Sts., because that is the coldest spot (geographically speaking). Moreover, this was the most economical place because the lines from the bulb to the equipment are the shortest. So far, the best results have been obtained here. Thus, the bulb is only indicative of the slab temperature in its immediate vicinity. The fact that the worst results have occurred in the High St. section implies that the bulb should be located where the slab usually gets the coldest. In this way, one could get quicker response and not have the present 10 hr time lag. However, to place the bulb in the most desirable spot where the fluid is coldest was considered uneconomical at the time of installation.

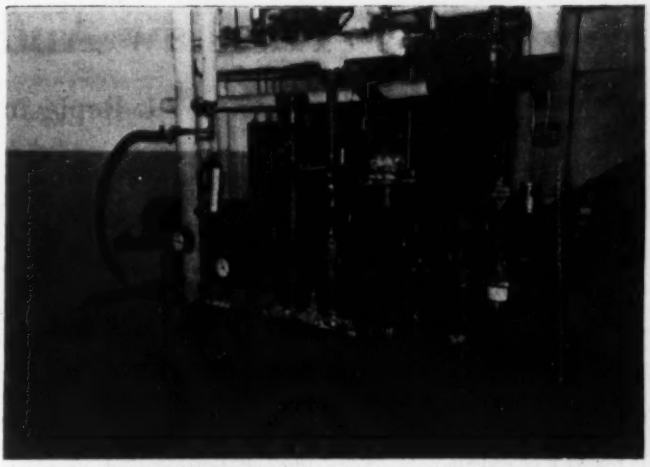


FIG. 2 — HEAT EXCHANGER EQUIPMENT for the No. 3 snow melting system. Note the non-permanent hose connection to the city water supply

Cost of Snow Removal and Snow Melting

The entire installation cost approximately $50,000. When operating at full capacity, the systems consume about 2000 lb per hr of steam, equivalent to 20 gph of oil, or $1.20 per hr, depending on the price of oil. The electricity used costs about 60 cents per hr.

As an example, consider an average snowfall in Boston of 44 in. per yr and divide this into 10 storms of four in. each and 10 hr duration each. If a 10 hr warm-up period is allowed before each storm, the total operating time will be 10 times 10 plus 10 times 10 or 200 hr, which at $1.80 per hr ($1.20 plus 60 cents) equals $360 total operating cost for an average year. If the carrying charge on the $50,000 installation cost were 12 percent, the total cost would be $6000 plus $360, or $6360.

If the snow were removed manually, it would have to be completely hauled away because the sidewalk is almost all private property, which means the snow cannot be pushed into the street. The average cost for manual snow removal from this sidewalk area is $150 per inch of snow. For the same assumed snowfall, the cost would be 44 in. times $150 or $6600 per yr.

With the snow melting method, there are also certain intangibles which cannot be calculated in dollars and cents. The sidewalks are clear even during a storm, which means greater safety and convenience for pedestrians, a cleaner building, and no deterioration from salt or calcium chloride. It also avoids a lot of back-breaking work.

ASRE MAKES RESEARCH GRANTS

THE AMERICAN Society of Refrigerating Engineers has authorized grants to a number of colleges for research pertaining to refrigeration, including one to Case Institute of Technology for work on heat transfer coefficients in evaporators and to Oklahoma A & M for studies of refrigerant desiccants.

The Law And Your Profits

1. Replevin Protection

FINANCING EQUIPMENT may well present legal pitfalls for the seller. For example, a refrigeration and air conditioning contractor recently found himself the possessor of an unrecorded chattel mortgage masquerading as a conditional sales contract, with the result that he lost title to the equipment and was unable to recover it by replevin.

Here's the true story, with make-believe names. Temcoe, Inc., sold the Noflaw Mfg. Co. an air conditioning unit on a conditional sales contract. Under this original contract, as all parties admitted, the seller retained title to the equipment.

Three weeks after installation, Noflaw mortgaged to Financial Associates all of its assets — some 692 items of factory equipment — including, either by accident or design, the air conditioning unit, to which Noflaw at that time had no title.

This mortgage, which covered future acquisitions as well as the items listed, was recorded by Financial on October 30. On November 25, Temcoe sold Noflaw a refrigerated "bar" and on December 4 a heating coil and thermostat. Shortly thereafter, Temcoe needed money and procured from Noflaw a note payable directly to the Solid National Bank and a new "conditional sales contract" payable to Temcoe. This second contract conveyed the bar, heating coil and thermostat, as well as the air conditioning unit. In addition, it covered the finance charges on both bar and heating coil. Temcoe pledged this contract to the bank with Noflaw's note attached thereto. Temcoe indorsed both note and contract with recourse, and received from the bank 90 percent of the paper's face value.

William Hurd Hillyer, author of this article, is a contributor to a number of banking and financial publications and has written several books on business. A former vice president and treasurer of the Atlanta Trust Co., his work there gave him a practical legal background.

Noflaw defaulted on his payments to the bank, so Temcoe was obliged to take a re-assignment of the collateral and pay the bank in full. Temcoe, relying upon the so-called conditional sales contract, next tried to get back its equipment by means of customary replevin proceedings, in which Financial was made a second defendant. Financial contested the replevin action, claiming not only the air conditioning unit, but the bar, heating coil and thermostat, through foreclosure of its *chattel mortgage*. Financial waived return of the equipment and asked for a money judgment for value.

The circuit court gave Temcoe the air conditioning unit and Noflaw was granted the money value of the bar, heating coil and thermostat. Nobody was dissatisfied with this latter part of the judgment, but Financial appealed from that part giving the air conditioning unit to Temcoe.

When the case came up on appeal before the state supreme court, Financial admitted that the original agreement between Temcoe and Noflaw was a sales contract, but claimed that the second so-called "conditional sales contract" was not such at all. The giving of the note direct to the Solid National Bank, followed by that institution's payment to Temcoe of money thereon, Financial insisted, operated as payment on contract No. 1. Furthermore, said Financial, the cashing of that note by Temcoe paid up the unpaid balance on contract No. 1, thereby giving Noflaw title to the equipment. Such equipment, reasoned Financial, became subject to their mortgage recorded October 30, which covered all property to be acquired.

Noflaw testified that by the terms of the note he and his company promised to pay the bank a sum substantially greater than what was owing on the air conditioning system. That sum, he swore, included the balance due for the bar, heating coil and thermostat, plus finance charges.

Though Noflaw was Temcoe's witness, the higher court viewed his testimony as convincing proof that "sales contract" No. 2 was made as a financing transaction. Such was its essence, according to testimony of Mr. Creditt, lending officer of the Solid National. He indicated that the No. 2 contract was in reality for the purpose of furnishing money to Temcoe, who made the transaction with the bank.

The supreme court refused to uphold contract No. 2 as a conditional sales agreement because "the following elements were present" — (1) A detachable note, payable to a third party, for a sum greater than the original conditional sales contract price, was part of the transaction. (2) Temcoe received payment from third party payee for that promissory note. (3) Chattels purchased under No. 1 agreement, for which No. 2 agreement was a substitute, were named as subject to No. 2 agreement. (4) Chattels bought on open account were co-mingled with those purchased on previously existing sales agreement.

The real intent and nature of the No. 2 transaction were revealed, said the court, by certain circumstances. There was a collateral agreement by Noflaw to pay money; he was liable for the payment of interest; he surrendered evidences of prior indebtedness or substituted others in their place; he was left in possession; a (bank) loan was applied for preceding or pending the transaction.

The court held that agreement No. 2 was a *chattel mortgage rather than a conditional sales contract.* As such it was powerless against a previously recorded chattel mortgage held by other parties. Reversing the judgment of the lower tribunal, the supreme court awarded Financial Associates a money judgment for the amount due on the air conditioning unit plus the value of the other items taken.

[Note: While this discussion applies to an actual case, it must be remembered that legal rules vary in different states.]

DATA sheet

Charts Aid Selection of Pipe Wall Thickness

THE ACCOMPANYING CHARTS are offered as a means of assisting designers in the selection of the proper pipe wall thickness for any given service conditions in power piping using plain end steel pipe. In some cases, the 1000 P/S value determined for the given conditions can be accommodated for all sizes by a single pipe schedule of those available. This fortunate situation can be identified at once from the first chart as soon as the 1000 P/S value is determined.

The schedule number system for a logically progressive series of pipe wall thicknesses is based on a dimensionless parameter or ratio equal to 1000 times the internal pressure divided by the corresponding bursting stress in the pipe wall.

The factor of 1000 was introduced for convenience in order to make the ratios derived from the expression come out as whole numbers. This results in having Schedule 40, Schedule 80, etc. instead of Schedule 0.040 and Schedule 0.080, which are more awkward to say.

Attention is called to the fact that the P/S values or 1000 $\times$ P/S values are dimensionless ratios that apply to any system of measurement.

In other attempts to select the proper pipe wall thicknesses for a given set of power plant service conditions, it sometimes develops that no single schedule number will satisfy code requirements in all pipe sizes. Under these conditions it becomes necessary to pick and choose from available schedules in order to make a series of selections that will be satisfactory for each of the respective sizes to be used.

While this could be done through repeated solutions of the pipe wall thickness formulas given in the American Society of Mechanical Engineers power boiler code and in the power piping and district heating sections of the American Standard Code for Pressure Piping, the process would involve considerable time and effort with the chance of making an error in the rather involved computations. It is simpler and more dependable, therefore, to read the answer from charts such as those shown herewith. In this way the problem can be visualized as a whole so that inconsistencies become apparent. Furthermore, the chance of making an error is reduced in proportion to the ease of solution.

The graph can be used directly for determining allowable P/S ratios for plain end pipe of the thickness schedules shown without having to make further adjustments for manufacturing tolerance and C allowance. In other words, manufacturing tolerances and C allowances were already provided for in computing and plotting the graphs.

The first chart was re-drawn by Taylor Forge & Pipe Works from the graph shown in the article entitled How To Use Schedule Numbers in Power Piping Design, by Sabin Crocker, Mechanical Engineer, Ebasco Services, Inc., Vice Chairman of the American Standards Association Sectional Committee B31 on Code for Pressure Piping, Secretary of the ASA Sectional Committee B36 on Standardization of Wrought Steel and Wrought Iron Pipe during the years it developed its schedule number system for pipe, and a member of HPAC's Board of Consulting and Contributing Editors. This article was published in the May 1951 issue of Heating, Piping & Air Conditioning, and may be referred to for information on the development and background of the schedule number system, and for examples showing the use of schedule number charts.

The second chart was prepared by Taylor Forge & Pipe Works to incorporate similar information for standard wall, extra strong wall, and double extra strong wall pipe.

CHART FOR SELECTING PIPE WALL THICKNESS

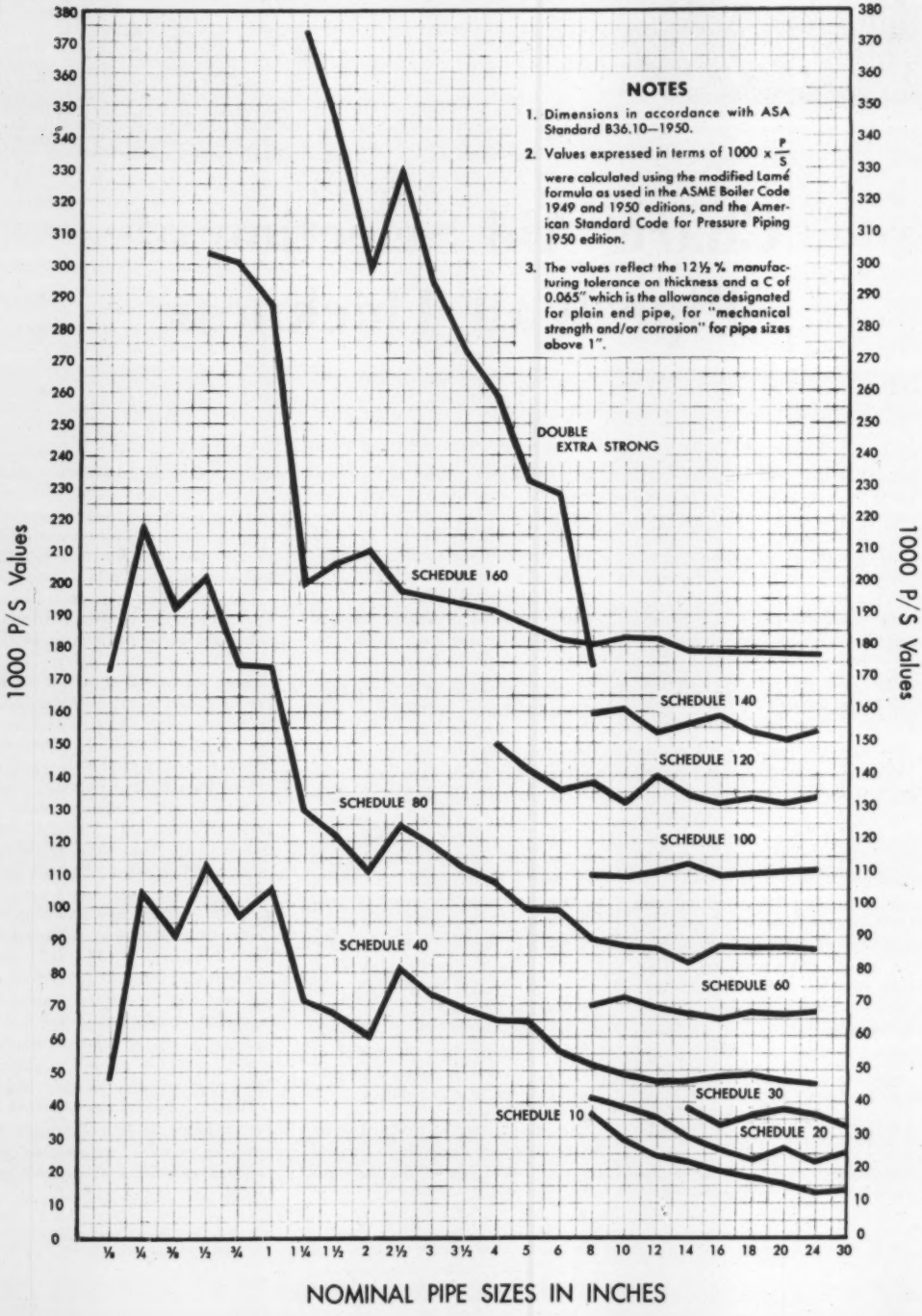
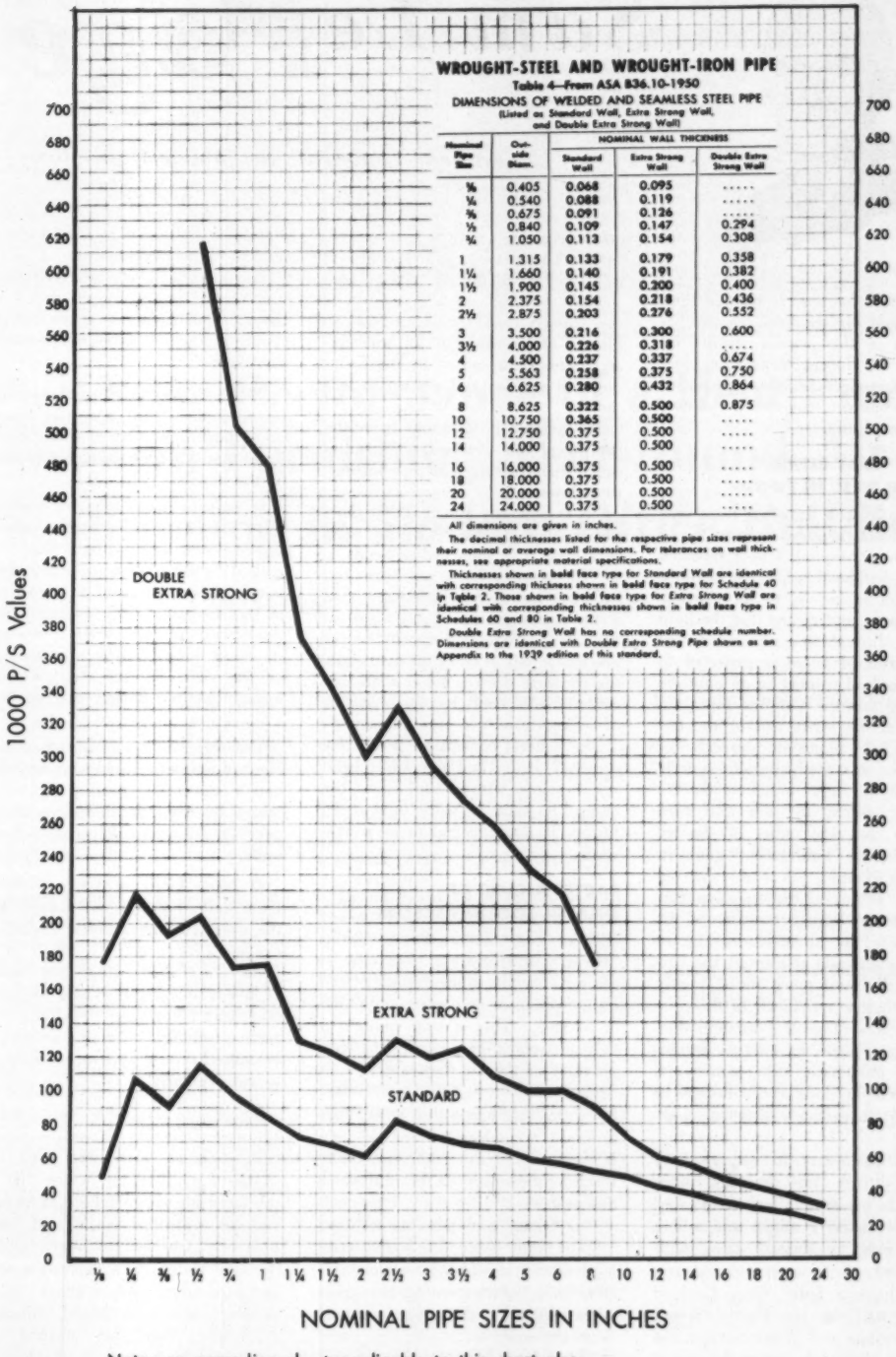

NOTES
1. Dimensions in accordance with ASA Standard B36.10—1950.
2. Values expressed in terms of 1000 x P/S were calculated using the modified Lamé formula as used in the ASME Boiler Code 1949 and 1950 editions, and the American Standard Code for Pressure Piping 1950 edition.
3. The values reflect the 12½ % manufacturing tolerance on thickness and a C of 0.065" which is the allowance designated for plain end pipe, for "mechanical strength and/or corrosion" for pipe sizes above 1".
DOUBLE EXTRA STRONG
SCHEDULE 160
SCHEDULE 140
SCHEDULE 120
SCHEDULE 80
SCHEDULE 100
SCHEDULE 40
SCHEDULE 60
SCHEDULE 30
SCHEDULE 10
SCHEDULE 20
1000 P/S Values
1000 P/S Values
NOMINAL PIPE SIZES IN INCHES

CHART FOR SELECTING PIPE WALL THICKNESS



WROUGHT-STEEL AND WROUGHT-IRON PIPE

Table 4—From ASA B36.10-1950

DIMENSIONS OF WELDED AND SEAMLESS STEEL PIPE
(Listed as Standard Wall, Extra Strong Wall, and Double Extra Strong Wall)

Nominal Pipe Size	Outside Diam.	NOMINAL WALL THICKNESS		
		Standard Wall	Extra Strong Wall	Double Extra Strong Wall
⅛	0.405	0.068	0.095	.....
¼	0.540	0.088	0.119	.....
⅜	0.675	0.091	0.126	.....
½	0.840	0.109	0.147	0.294
¾	1.050	0.113	0.154	0.308
1	1.315	0.133	0.179	0.358
1¼	1.660	0.140	0.191	0.382
1½	1.900	0.145	0.200	0.400
2	2.375	0.154	0.218	0.436
2½	2.875	0.203	0.276	0.552
3	3.500	0.216	0.300	0.600
3½	4.000	0.226	0.318	.....
4	4.500	0.237	0.337	0.674
5	5.563	0.258	0.375	0.750
6	6.625	0.280	0.432	0.864
8	8.625	0.322	0.500	0.875
10	10.750	0.365	0.500	.....
12	12.750	0.375	0.500	.....
14	14.000	0.375	0.500	.....
16	16.000	0.375	0.500	.....
18	18.000	0.375	0.500	.....
20	20.000	0.375	0.500	.....
24	24.000	0.375	0.500	.....

All dimensions are given in inches.

The decimal thicknesses listed for the respective pipe sizes represent their nominal or average wall dimensions. For tolerances on wall thicknesses, see appropriate material specifications.

Thicknesses shown in bold face type for *Standard Wall* are identical with corresponding thickness shown in bold face type for Schedule 40 in Table 2. Those shown in bold face type for *Extra Strong Wall* are identical with corresponding thicknesses shown in bold face type in Schedules 80 and 80 in Table 2.

Double Extra Strong Wall has no corresponding schedule number. Dimensions are identical with *Double Extra Strong Pipe* shown as an Appendix to the 1939 edition of this standard.

Notes on preceding chart applicable to this chart also.

Sam Lewis' Page

. . . . . *pertinent comment on practical problems*

• Informal comment on heating, piping and air conditioning matters is given in this regular feature by Samuel R. Lewis, consulting mechanical engineer and a member of HPAC's board of consulting and contributing editors.

USING "EASY BENDS," "SWEEP TEES" IN PIPING

IN STUDYING THE drawings for a very large steam heating system for a government hospital, I note repeated use of bull-head pipe connections. The term is known to all old-time steamfitters, and means that the fluid flowing through one pipe connected to the run of a tee is expected to meet the fluid coming in an opposite direction through a second pipe connected at the other end of the tee.

The two opposing currents of liquid or gas are expected, quietly and without any objection on the part of either, to join and turn through the side outlet of the tee and not to be "bull headed" about it. This expectation invariably is defeated. If one of the opposing currents enters through the side of the tee, while the other enters one of the through ends of the tee, the currents will blend much more quietly and with less resistance to flow.

Designers of central vacuum dust cleaning systems, as well as designers of pneumatic tube conveyors, like to employ long sweep fittings in an effort to reduce resistance to air flow.

It is customary to employ long sweep fittings for drainage pipes where the pressure difference to cause flow is relatively slight and where solids may be flushed along with the liquid.

We have a letter from England asking why, in the United States, the drawings and illustrations in the magazines seem to ignore the use of "easy bends" and "sweep tees" in the piping employed for heating systems. The letter inquires whether it is correct that short elbows and square tees are used generally in this country, and asks if long sweep fittings are considered an unnecessary refinement caused by designing down to a price and not up to efficiency.

My answer is to quote from the catalog of one of the large international manufacturers of pipe fittings, as follows:

"It is generally assumed that short radius elbows produce a greater pressure drop than long radius bends.

"This assumption is not borne out by tests, however, which show that if the mean radius of curvature of the elbow is equal to approximately one and a half or two pipe diameters, the pressure drop is lower than that caused by a bend having a radius of curvature of five pipe diameters".

The general conclusion is that for ordinary steam and hot water heating systems within buildings, the gain to be made by using long sweep fittings is not sufficient to be worthwhile.

BACTERIA CLOG UP THEATER COOLING SYSTEM

ONE OF OUR readers has a 40 hp "Freon" refrigerating plant in a theater. Water comes from a well on the premises and leaves the pump at 57 deg. This is cool enough to help materially in reducing the temperature of the air that is drawn in from outdoors. The cool water flows through precooling coils, goes around the condenser tubes and then is sprayed on the roof, eventually reaching the sewer via the rain water downspouts.

Our friend complains as follows:

"The water from this well carries a peculiar type of bacteria known as crenothrix, which give up the ghost when exposed to the oxygen released from the well.

"The dead bacteria are precipitated on the condenser tube surfaces and look and act like rust or iron oxide. The accumulation of dead bodies eventually prevents adequate heat transfer from the refrigerant to the water, and removal of the deposit requires frequent and objectionable servicing.

"Is there any coating that could be applied to the condenser tubes, or is there some sort of water treatment that will prevent accumulation of the deposit?," he asks.

It happens that I know of another large air conditioning system where the cool well water, after having absorbed as much heat as practicable, is sprayed on the roof to evaporate in the sunlight. It is claimed that the downspouts, which are competent in cloud bursts during nine months of the year, become clogged with organic matter during hot weather when water is sprayed in this way.

The water of rivers or lakes that has had long exposure to sun and air, does not seem to manifest this crenothrix trouble. Neither does it appear in all water that comes from wells.

If some kinds of water pumped from wells, however, is sprayed into the open air, the peculiar organism evidences its peculiarity. Well water from gravel beds along the valley of one romantically-named river is especially notorious. Providing corrective techniques for this water has permitted several apparatus salesmen to eat regularly.

There are available well known automatic injection devices for chemicals, such as have been used for years to sterilize the water that is refiltered for natatoriums. Crenothrix can be controlled easily and inexpensively, I believe, by injecting into the cool water, as it leaves the well pump, a small and relatively inexpensive amount of liquid chlorine. I believe that this method of poisoning the bacteria is effective.

Heating, Piping & Air Conditioning
THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS
JOURNAL SECTION

Two-Year Performance of a Heat Pump System Furnishing Year-Round Air Conditioning in Modern Office Building

By Philip Sporn* and E. R. Ambrose**,
New York, N. Y.

SUMMARY — This paper describes a 225 hp heat pump system using outdoor air as the heat source and heat sink.

The year-round air conditioning is supplied to a modern six-story office building in Roanoke, Va. This system possesses many unusual features which improve its economy.

In addition to describing the design features and equipment selection, an analysis is made of the power consumption and performance for the two-year period.

A 225 horsepower heat pump system using outdoor air as the heat source and heat sink has been furnishing the year-round air conditioning in the new modern, six story office building of Appalachian Electric Power Co. at Roanoke, Va., for the past two years. Since this system possesses a number of unusual and attractive features, it is believed that a brief description of the design and equipment selection, together with a discussion of performance including an analysis of the electric energy consumed during this period, will be informative and interesting.

The Building and Equipment Location

The building, enclosing a volume of 1.15 million cu ft excluding the garage, is 152 ft long by 96 ft wide by 60 ft high and provides 87,600 sq ft of floor area. The garage has 9150 sq ft of floor area and a volume of 92,000 cu ft. The outdoor air coils are located in the penthouse above the sixth floor and the outdoor air fans are located directly above on the penthouse roof. The fans discharge the outdoor air vertically downward through the coils, then back to the outside. Basement storage tanks charged with warm or cold water, depending on the season, provide practical compressor selections having flexible and efficient operation. All of the other heat pump equipment is located in the penthouse above the sixth floor. Individual room control is obtained by 153 unit room air conditioners located throughout the building, and supplemented by a direct system for ventilation air.

A more complete description of the building and of the heat pump system, along with some photographic views of the installation was given in a previous paper.[1]

Capacity Requirements and Operating Cycle

The calculated heating and cooling requirements are given in Table 1. The calculated heat loss is 1.41 million Btu per hr at an outdoor design temperature of 15 F, and the calculated heat gain is 2.079 million Btu per hr at an outdoor design temperature of 95 F dry bulb and 78 F wet bulb.

The heat pump consists of three 75 hp, reciprocating, Freon 12 compressors each having its own heat

*President, American Gas and Electric Service Corp.
**Air Conditioning Engineer, American Gas and Electric Service Corp. Member of ASHVE.
Presented at the Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Portland, Ore., July 1951.

[1]Outdoor Air is the Heat Source for Office Building's Heat Pump, by Philip Sporn and E. R. Ambrose (*Heating, Piping & Air Conditioning*, January 1950, p. 138).

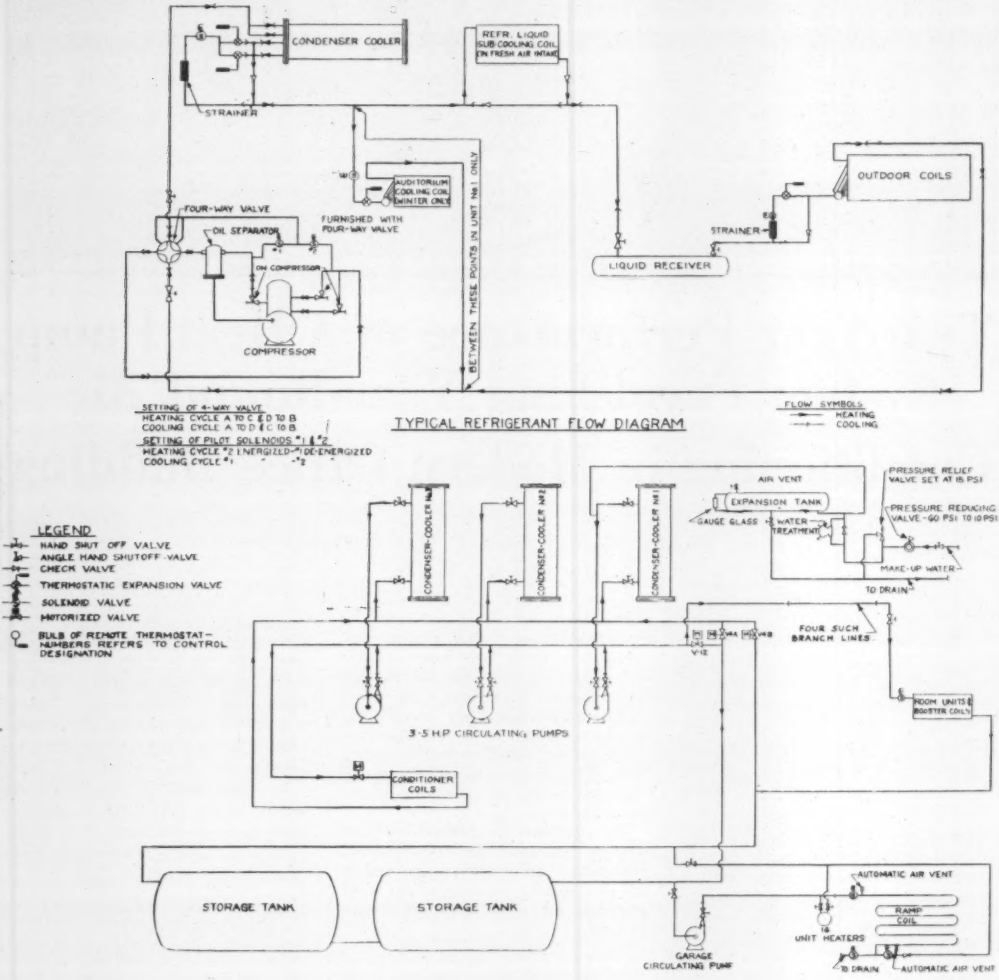


Fig. 1—Schematic refrigerant and water flow diagram for heat pump system

dissipating and heat absorbing surfaces, and so arranged to give three independent, indirect systems. The heating and cooling cycle of one of the three heat pump systems is given by Fig. 1. The circuits of the other two systems are identical, except for the auditorium coil which is in system No. 1 only. This coil furnishes cooling to the auditorium when the main system is on the heating cycle, and provides heating when the main system is on the cooling cycle.

During the heating cycle the path of the refrigerant is from the compressor, through the oil separator, 4-way valve, condenser-cooler, liquid subcooling coil, liquid receiver, expansion valves, outdoor coils, and then back through the 4-way valve to the compressor. The path of the water during this cycle is from the room conditioner units, conditioner coils, booster coils, and/or the storage tanks, through the 2-way valve, condenser — cooler, and the circulating pump back to the several sur-

Table 1—Heating and Cooling Requirements

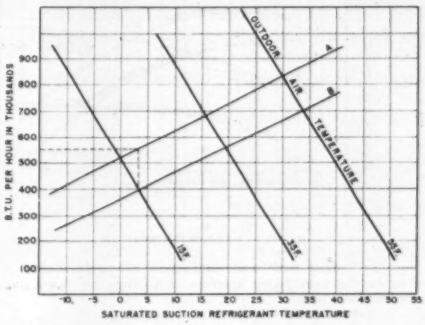
	Heat Gain Btu/Hr	Heat Loss Btu/Hr
Sensible:		
Conduction) Walls	4,000	
and) Windows	382,000	674,000
Sun Effect) Floors and Roof	62,000	
Lights	531,000	
Ventilation Air	275,000	736,000
People	195,000	
Latent:		
Ventilation Air	480,000	
People	150,000	
Total	2,079,000	1,410,000
Design Conditions		
Heating: Indoor temperature	72 F	
Outdoor temperature	15 F	
Cooling: Indoor temperature 80 F and	50% RH	
Outdoor temperature 95 F and	78 F WB	

faces. The liquid refrigerant subcooling coil, shown in Fig. 1, preheats the ventilation air.

During the cooling or defrosting cycle the refrigerant leaving the compressor flows in turn through the oil separator, 4-way valve, outdoor coils, liquid receiver, expansion valves, and condenser-cooler, and then back through the 4-way valve to the compressor to repeat the cycle. The path of the water during the cooling cycle is the same as that for the heating cycle.

Garage heating is independent of the main system. It is accomplished by circulating water from the storage tank through ceiling units by means of a fourth pump. In addition, warm water from the garage system can be circulated through the embedded coils in the concrete ramp to the garage when snow melting and ice prevention are required.

Fig. 2 gives the useful heating capacity of one of the three heat pump units at several outdoor air and suction refrigerant temperatures. The heating effect, due to subcooling the liquid refrigerant in the condenser-cooler and the ventilation air coil, is included. The outdoor air fans are operating at 395 rpm. It can be seen that the heating output of one of the heat pump units is 553,000 Btu per hr at 15 F dry bulb outdoor temperature. The three units, therefore should easily satisfy the building requirements at design conditions. In addition, the storage tanks filled with hot or cold water, depending on the cycle, will supplement the compressor capacity. The storage tanks are charged at mild outdoor



A—Useful heating capacity
B—Outdoor coil refrigeration capacity including refrigerant liquid subcooling effect

Fig. 2—Useful heating capacity and outdoor coil refrigeration capacity of one of the heat pump units at various outdoor air and suction refrigerant temperatures. Outdoor fans operating at 395 rpm to deliver 49,000 cfm

temperatures when the excess compressor capacity is available.

Field Test Data

Tables 2 and 3 show a sample of the test data taken during the past two years to check the performance of the Roanoke system. The data given in Table 2 are based on the outdoor fans operating at 565 rpm, and Table 3 on the outdoor fans operating at 395 rpm. The fans operated at the higher speed when the system was first installed, but were changed to the lower speed in order to increase the coefficient of performance and at the same time, to reduce the fan noise transmitted to the adjacent building. Operating the outdoor fans at the lower speed raised the coefficient of performance from 16 to 22 percent and reduced the electric demand by 13 to 15 percent. The air and water temperatures, electric demand of the various motors, compressor operating pressure,

Table 2—Typical Performance Data for Roanoke Heat Pump System with Outdoor Fans Operating at 565 rpm

	Heating Cycle			Cooling Cycle
	One Compressor	Two Compressors	Three Compressors	One Compressor
Conditioner coil				
Air circuit, cfm	60300	60300	60300	60300
Leaving temp, F	73	74	88	69DB/67WB
Outdoor coil				
Air circuit, cfm	71000	142000	213000	71000
Entering temp, F	78.5	54	44	92
Leaving temp, F	50.0	46	37.5	104.3
Condenser-cooler				
Water circuit, gpm	250	500	750	250
Entering temp, F	93	93	99	67
Leaving temp, F	99	98.5	104.3	61
Electric demand of motors, KW				
Compressor	51.8	101.6	147.9	63.0
Water circulating pumps	4.8	7.8	11.0	4.8
Conditioner fan	25.8	25.8	25.8	25.8
Outdoor fans	21.0	40.8	65.3	21.0
Total	103.4	176.0	250.0	114.6
Compressor head pressure, psig	143	135	149	180
Compressor suction pressure, psig	33	28	20	47
Coil refrigerant effect, million Btu/hr	0.719	1.288	1.564	0.740
Useful heat, million Btu/hr	0.896	1.631	2.068	—
Coefficient of performance based on Electric Energy to compressor and outdoor fan motors	3.6	3.35	2.85	—

Note:
1. 100 percent of electric energy to compressor motor considered as useful heat.
2. Subcooling effect of the liquid refrigerant in the condenser-cooler and the fresh air coil considered useful heat.
3. This performance data can only be considered as approximately correct due to the difficulties of obtaining reliable air and water temperatures, and air flow measurements in the field. The results are believed to be sufficiently accurate, however, to indicate that the system is performing in accordance with the design requirements.

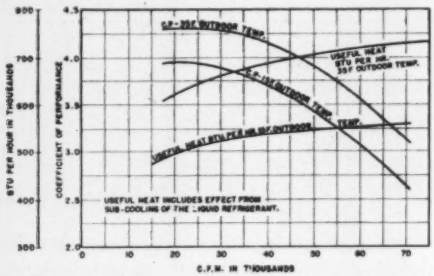


Fig. 3—Useful heat and coefficient of performance of one of the heat pump systems at various air flows over the outdoor coils

and the capacity in Btu per hour, during the heating and cooling cycles at the 565 rpm outdoor fan speed as well as the 395 rpm speed, are also given in Tables 2 and 3.

The effect of the outdoor fan speed on the overall performance of the system sometimes is not fully realized. Fig. 3 gives the useful heating effect and coefficient of performance at various air flows over the outdoor coils for this particular installation. The curves show that the air flow resulting in the highest coefficient of performance for the compressor and outdoor coil combination is about 27,000 cfm. Unfortunately, use of this low air flow seldom results in the most practical installation as far as first cost is concerned. Quite frequently, as was necessary in this installation, some compromises must be made in the design which usually reduces the coefficient of performance below the maximum obtainable.

Design Information and Equipment Selection

Some information on design and equipment selected for the heat pump system is given in Table 4. All equipment and the procedures for its selection are the same as those normally used on conventional air conditioning systems. One possible exception is the 4-way valve which was designed especially for heat pump systems. Since some of the equipment is used for both heating and cooling, the equipment must be checked to make certain that the design requirements are fulfilled during both cycles. This applies particularly to the conditioner coil which must be sized to have a definite sensible and latent head capacity during the cooling cycle, and, at the same time provide the required sensible heating during the other cycle. The selection given in Table 4 illustrates the types and kind of equipment which have been found satisfactory for this type of application.

Domestic Hot Water

In addition to the heat pump for year-round comfort air conditioning, a small heat pump supplies the domestic hot water requirements for the entire building. The air exhausted from the building is used as the heat source. This heat pump was designed to heat 50 gal of water per hr from 50-120 F. The heated water is stored in a 300 gal insulated tank. Exhaust air from the building goes over the compressor and through the cooling coil to the exhaust fan, where it is discharged to the outdoors. The heat removed from the exhaust air by the cooling coil is raised to a higher temperature and transferred, together with the heat equivalent of the work of compression, to the water by means of a refrigerant-water heat exchanger.

Table 5 gives some useful design information and equipment selection for the heat pump water heater. A 3 hp, direct connected, hermetically-sealed Freon 12 compressor-motor is used. It has been operating satisfactorily since its installation two years ago.

General Performance

The 153 conditioner units and the forced air distribution system which conditions the internal area and supplies all of the ventilation air requirements maintain comfortable conditions throughout the building during both the heating and cooling cycle. On bright sunny days during

Table 3—Typical Performance Data for Roanoke Heat Pump System with Outdoor Fan Operating at 395 rpm

	Heating Cycle		Cooling Cycle	
	One Compressor	Two Compressors	One Compressor	Two Compressors
Conditioner coil				
Air circuit, cfm	60300	60300	60300	60300
Leaving temp, F	68	75	67DB/65WB	66DB/64WB
Outdoor coil				
Air circuit, cfm	49000	98000	49000	98000
Entering temp, F	55	33	92DB/74WB	91DB/73WB
Leaving temp, F	42.5	27.0	109.0	107.5
Condenser cooler				
Water circuit, gpm	250	500	250	500
Entering temp, F	92.0	93.0	60.0	59.0
Leaving temp, F	97.8	97.4	54.5	53.5
Electric demand of motor, kw				
Compressor	50.8	97.6	56.0	110.0
Water circulating pump	4.8	7.8	4.8	7.8
Conditioner fan	25.8	25.8	25.8	25.8
Outdoor fan	8.4	16.8	8.4	16.8
Total	89.8	148.0	95.0	105.4
Compressor head pressure, psig	140	135	157	155
Compressor suction pressure, psig	30	18	42	41
Coil refrigerant effect, million Btu/hr	0.694	1.044	0.720	1,400
Useful heat, million Btu/hr	0.867	1.376	—	—
Coefficient of performance based on electric energy to compressor and outdoor fan motors	4.28	5.53	—	—

Note:
1. 100 percent of electric energy to compressor motor considered as useful heat.
2. Subcooling effect of the liquid refrigrant in the condenser-cooler and the fresh air coil considered useful heat.
3. This performance data can only be considered as approximately correct due to the difficulties of obtaining reliable air and water temperatures, and air flow measurements in the field. The results are believed to be sufficiently accurate, however, to indicate that the system is performing in accordance with the design requirements.

moderate weather, however, when little heating or cooling is needed, the temperatures in the external offices facing west are sometimes several degrees higher than the rest of the building. Although this happens rather infrequently and is not highly objectionable, provisions have been made to modify the electrical controls and piping to zone the conditioner unit on this side of the building.

During one extremely cold and windy period, the water in one of the end turns of the conditioner coil froze, causing a leak. This was probably caused by the ventilation air which passed over the coil before being mixed thoroughly with the recirculated air. Several subsequent cold spells have occurred since then without a recurrence of this trouble.

The heat pump equipment has required relatively little maintenance and service during the two-year period. Two of the compressor shaft seals had to be replaced shortly after putting the system in operation. This trouble was probably due to foreign matter gaining access to the system during the installation. The 4-way valves were erratic in performance and gasket refrigerant leaks developed during the first few months of operation. These difficulties, soon eliminated, are understandable when it is realized that the 4-way valve used on this installation is the first of this size ever made by the manufacturer. The discs of the valves were found to be defective when they were opened recently after almost two years of operation. The manufacturer has since redesigned these discs and it is felt that no further valve trouble will be experienced. The only other operating difficulties were several small refrigerant leaks which were found on four occasions during routine inspection. The outdoor defrost cycle has operated quite satisfactorily from the beginning and no service or maintenance was necessary as a result of frost accumulation.

Table 5—Design Information on the Roanoke Heat Pump Water Heater

Compressor	
Type	F-12, Hermetic
Nominal hp	3
Condenser	
Surface area, sq ft	135
Cooling Surface	
Height x nominal tube length, ft	2.44 x 3
Face Area, sq ft	7.11
Total surface:	
Air side, sq ft	730
Refrig side, sq ft	37
Depth, rows	4
Fins, per inch	9
Tube outside diameter, inches	⅝
Air flow, cfm	4460
Air velocity, fpm	627
Condenser circulating water pump	
Type	Direct Connected
Nominal hp	1/6
Speed, rpm	1725
Capacity, gpm	10
Total head, ft	7

Table 4—Design Information on the Equipment Selected for the Roanoke Heat Pump Year-Round Air Conditioning System Using Air as Heat Source

	Conditioner System	Liquid Refrigerant Subcooling (3 Required)	Outdoor System (1 Required)
Compressors			
Nominal hp	3 - 75		
Speed, rpm	875		
Refrigerant	F-12		
Condenser-cooler			
Nominal tube length x outside diameter, inches	96 x 24		
Passes	8		
Tubes	380		
Tube outside diameter, inches	⅝		
Effective area, sq ft	580		
Water flow per unit, gpm	250		
Water circulating pump			
Nominal hp	5		
Speed, rpm	1750		
Capacity, gpm	250		
Total head, ft	50		
Type	Direct Connected		
Fans			
Size	No. 8		No. 8
Type	DIDW		DIDW
Speed, rpm	584		395
Capacity, cfm	60400		49000
Static pressure, inches of water	2.0		0.7
Coils			
Height x nominal tube length, ft	7.31 x 8 and 7.31 x 6	2.44 x 7	8.94 x 9
Face area, sq ft	102.45	17.0	80.45
Total surface: Air side, sq ft	15800	437	12390
Refrig side, sq ft	—	22	634
Water side, sq ft	807	—	—
Depth, rows	6	1	6
Fins, per inch	9	9	9
Tube outside diameter, inches	⅝	¾	—
Air flow, cfm	60400	4000	49000
fpm	590	235	610

Electrical Consumption

The monthly electrical consumptions of the lights and of the heat pump during the heating and cooling cycle are given in Table 6. The monthly degree days and a calculated heat factor are also included in Table 6.

Attempts have been made to find a constant which could be used to check the periodic operating cost of any particular system, and, at the same time, would serve as a basis for comparing the operating cost of different heating systems in different geographic areas. One such factor used extensively for this purpose is based on degree days and space volume. The heat factor in Table 6 is based on degree days and the calculated heat loss of the structure. It is equal to the kilowatt hours during the heating cycle, divided by the kilowatt equivalent of the heat loss per degree day and by the actual degree days.

Domestic water consumption and kilowatt hours consumed by the heat pump water heater were recorded for an eighteen month period, but not included in Table 6. The average daily water consumption was 278 gal, requiring an electrical energy consumption of 38.2 kwhr. Tests showed, however, that the daily tank and pipe loss of the domestic hot water system is 24 kwhr. Consequently, the energy consumption for the useful heat to the water is 14.2 kwhr.

Conclusions

1. A study of the equipment selection, given as Table 4, not only shows that the

same design procedure is used for both the heat pump and conventional air conditioning system, but also that the same equipment except for possibly the 4-way valve, is applicable. The 4-way valve used on this installation and other similar valves are now becoming more readily available. It also might be noted that two 3-way valves may be substituted for the 4-way valve in most of the cycles. This is sometimes done on the smaller installations to reduce the possibility of heat transfer between the high temperature discharge gas and the low temperature suction gas. In the case of the four inch 4-way valves, used on this installation, this heat transfer was found to be practically negligible.

2. Some precaution must be exercised in a heat pump design in order to obtain the most efficient operation within practical limitations. The auxiliaries are the chief offenders in lowering the coefficient of performance. As illustrated by Fig. 3, the outdoor fan alone can easily reduce the all important efficiency by as much as 16 to 22 percent. Other equipment, such as the circulating pump and conditioner fan, can have an equally adverse effect if not carefully selected.

3. Three separate and distinct systems were purposely used instead of one large system in order to provide more flexible and dependable operation under variable loads. Using three smaller systems instead of one large system also provides means of maintaining a minimum electrical demand. A majority of the commercial electrical rates are based on the maximum demand which occurs during the billing period. An electrical load having a high demand and a low consumption does not favor a low electrical energy cost. By having a multiple number of units, it is possible to decrease the demand by operating fewer units for longer periods. A further advantage of multiple units with a storage system is that possible benefits from off-peak rates may be realized. Loads may be arranged over a 24-hr period in such a manner, with a storage system, that the total maximum demand for all requirements is materially reduced.

4. In general, the heat pump system required relatively little maintenance and service after the first few months of operation. During this initial period, some difficulties were experienced with the 4-way valves, with the compressor shaft seals, and with a few refrigerant leaks. These troubles were soon eliminated, and, with the improved 4-way valve discs, now available, it is believed that the system will continue to perform in a creditable manner.

5. The actual energy consumption during the heating cycle indicates that the operating cost of a heat pump system, using air as a heat source, is competitive with other fuels in the Roanoke area. The heat factor was computed in Table 6 in order to try to find a constant which can be used to evaluate the heating performance. There is a noticeable difference in the factors for the mild months and for those having severe outdoor temperatures. Part of this difference is undoubtedly due to the wind and sun effect as well as to the heat from the lights which were not considered in the heat factor as computed. Care must be exercised in the use of such a factor until all the influencing items can be properly introduced. It is hoped that with additional data on this and other installations, an acceptable and reliable heat factor can be developed.

6. It is to be noted that the compressor head pressure will be lower with a corresponding reduction in kilowatt hours when water sprays are used on the outdoor coils during the cooling cycle. Sprays have been used on several such installations but were not believed to be practicable for this system. The installation was so made that the equipment would not have to be relocated or the design changed when future plans for three additional floors materialize. This would have been more difficult to accomplish if evaporative cooling had been incorporated in the design.

7. The heat pump water heater for domestic water is a very practical application which has proven to be very satisfactory during the past two years. It provides maximum efficiency by removing heat from the air being discharged from the building and which otherwise would be wasted. This same type of system has a number of possible applications. The heat removed from the exhaust air can be used to heat the service water, as in the case of Roanoke, or used to heat the ventilation air for the building, as in the case of a hospital where 100 percent outdoor air was required for ventilation. Application of such a design to the latter system improves the efficiency considerably at the lower outdoor temperatures.

8. The heat pump possesses many unique and desirable features which are adaptable to practically any type and design of year-round air conditioning system. The heat pump can provide instantaneous, automatic and simultaneous heating and cooling with the same equipment. A chimney is not required for the unit because no flame of any kind is used and, consequently, there are no products of combustion, soot, dirt or odors. The system requires only an electric utility service and can be located in the basement, on the roof, in the attic, in a utility room, or almost any other place in a structure.

9. It seems reasonable to expect that the number of heat pump installations will increase materially as engineers, architects, and contractors become more familiar with their many desirable features and with the various possible operating cycles. It is hoped that the information given in this paper will serve a useful purpose by indicating the possibilities and potentialities of the heat pump in the air conditioning field and by stimulating and encouraging a greater interest and activity in this type of system.

Table 6—Monthly Kilowatt Hours for Lighting and Heat Pump During Heating and Cooling Cycle

Month	Kilowatt Hours			Degree Days	Heat Factor
	Lights	Heating	Cooling		
1949					
April	65,200	28,200	15,000	343	0.472
May	82,800	1,250	49,950	82	0.088
June	64,000	—	54,400	1	—
July	67,200	—	80,000	—	—
Aug.	71,200	—	86,000	6	—
Sept.	72,000	3,900	55,500	101	0.222
Oct.	72,800	12,000	44,000	149	0.463
Nov.	75,200	39,600	6,800	536	0.425
Dec.	80,800	73,800	1,400	767	0.553
Total	651,200	158,750	392,850	1,985	0.371 (Average)
1950					
Jan.	72,800	56,800	4,000	534	0.611
Feb.	80,000	65,200	400	686	0.546
March	64,000	73,400	2,600	687	0.614
April	71,200	33,800	16,600	346	0.562
May	67,200	6,200	37,000	55	0.648
June	76,000	200	68,600	10	0.115
July	56,000	—	64,900	—	—
Aug.	70,400	—	75,200	—	—
Sept.	67,700	1,900	63,700	88	0.124
Oct.	66,000	6,100	25,900	167	0.210
Nov.	71,200	38,600	11,000	628	0.354
Dec.	79,200	111,700	300	911	0.704
Total	841,700	393,900	369,300	4,112	0.449 (Average)
1951					
Jan.	68,000	87,700	300	817	0.617
Feb.	76,000	98,000	6,000	703	0.801
March	75,600	70,300	2,500	630	0.641
Total	219,600	256,000	8,800	2,150	0.686 (Average)
Two Year Total	1,712,500	808,650	770,950	8,247	0.462 (Average)

Note:
1. Speed of outdoor fans reduced during February 1950
2. Heat Factor = kwhr during the heating cycle/[(kw equivalent of calculated heat loss per degree day) (actual degree days)]

Energy—Choose It Wisely Today for Safety Tomorrow

By G. W. Gleeson*, Corvallis, Ore.

IN THE concept of the broad divisions of the entity of engineering, we include men, money, methods, materials, manufacture, and energy. It is significant that we separate and fragment each broad classification to our probable detriment, but, basically, the study of energy as a whole subject is fundamental to any and all engineering patterns. When considered from the viewpoint of the attributes of our western civilization, furthermore, all else depends upon our ability to utilize our energy resources. Without adequate energy resources, manufacture cannot take place, consideration of methods becomes insignificant; material cannot be processed for use; money will not circulate, and men will not prosper according to our present day standards.

It is common practice to study energy in a fragmented part, even to the second and third degree of fragmentation. For example, we circumscribe a field of thermodynamics for mechanical engineers, calling it, perhaps, fuel and combustion, or heat power, but we do not include within the boundaries the total subject matter pertinent to even the first breakdown. We fragment further to include only that portion of thermodynamics or other subject matter which a mechanical engineer *commonly* uses, and then, because we have lost the fundamental continuity of a whole pattern, we resort to empiricism and tabular or graphical means of calculation which are restricted to single working substances or fixed conditions. The more we fragment, the more we limit the range of the subject and straight-jacket our thinking.

If this paper does nothing more than raise the singular subject of energy above the detail of its fragmented parts, it will have served a purpose. However, it is intended to evaluate energy as a resource, irreplaceable in large part, and deal with the resource upon the same basis as we would our resources of material. The *conservation of energy* is more than a law of physics or principle of thermodynamics. Our dependence upon our energy resources is perhaps even more significant than our dependence upon material, but our consideration of such resources appears to be inversely proportional to our use.

Accordingly, that which follows attempts to consider all energy resources, as it is highly probable that the pattern of energy usage in the not too distant future will involve an appreciable amount of substitution of sources, either directly or through new process development. It is pertinent to mention that considerations of energy alone may indicate possible shifts of population centers and most certainly shifts in industrial concentration. It is certain that more complete integration of energy uses compatible with domestic or industrial requirements will be necessary and will be dictated by economic considerations if not by conservation practice.

The writer is particularly indebted to many previous authors and all sources of information as enumerated in the appended bibliography.

General Considerations

As would naturally be the case as dictated by economy, man has made greatest use of those energy resources which were most accessible or *packaged* in the most desirable physical state. Accordingly, our so-called fossil fuels, including coal, petroleum, and natural gas have been most widely exploited. Energy sources may be classified for considerations of conservation into two broad categories: (1) Continuous sources of energy which can be used to maximum possible extent without depletion; and (2) discontinuous sources of energy which have definite, although somewhat unknown, limitations in amount. The fuels of greatest current use fall within the discontinuous classification; hence, the prospect of ultimate depletion of reserves of the discontinuous type become a reality under conditions of current rate of use.

Enumerating according to the classification:

(*1*) *Continuous Sources of Energy*: *a*. Water Power; *b*. Energy from Vegetation (directly and indirectly); *c*. Solar Energy; *d*. Wind Power; *e*. Earth Heat; *f*. Tidal Power; *g*. Tropical Waters; *h*. Heat Pump.

(*2*) *Discontinuous Sources of Energy*: *a*. Coal; *b*. Petroleum; *c*. Oil Shales; *d*. Natural Gas; *e*. Atomic Energy.

In the following, each of the energy sources will be discussed briefly, particularly from the standpoint of limitations. Such discussion must, obviously, be confined by present day concepts and be without the benefit of such future developments as man is certain to bring forth. It is significant that most authorities agree that the major advances of the future will be in the field of continuous energy supplies. Yet, at the present time, attention is almost exclusively directed toward our discontinuous sources, and, because we are more familiar with them, such sources will be given priority in order of discussion.

Before a consideration of individual fuels, it is pertinent to provide a

*Dean of Engineering, Oregon State College. Presented at the Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, Portland, Ore., July, 1951.

Table 1—World Resources of Energy

As Millions of Tons of Bituminous Coal	
North America	3,087,143.6
South America	166,881.0
Europe*	789,548.8
U.S.S.R.	1,313,685.3
Asia*	2,347,544.1
Africa	765,005.3
Oceania	190,477.7
World	8,660,285.8
Selected Countries	
United States	2,513,693.4
China	2,158,840.0
Germany	308,170.5
South Africa	210,370.0
British Isles	177,047.5
Australia	141,158.0
India	99,754.6
Poland	97,380.5
Japan	41,658.2
France	33,472.0

*Exclusive of U.S.S.R.

frame of reference in terms of the estimated overall world resources of energy as set forth in Table 1 in equivalent terms of millions of tons of bituminous coal.

It appears to be a paradox, but, in terms of the present direction of technical evolution, Asia, particularly China, and North America have the greatest potentialities for progress. It is necessary that America maintain a rate of capital growth sufficient to offset the energy and population potentials of Asia if we are to maintain our dominant position in world affairs. This statement stems from the commonly recognized fact that national power depends upon three major components, population, energy resources, and the application of capital or its equivalent.

Furthermore, as a general consideration, we cannot escape our obligation or responsibility to future generations. Repudiation of such responsibility robs life of its significance, although we seldom take time to consider the full meaning of our transient existence. Certainly, we of the present generation are, in part, guardians of the future; we simply have lease upon the *stuff of life*, but we appear bent upon consumption of the leaseholding. Most certainly, future generations have some equity in that which we so unthinkingly consume today, hence, conservation in its broad aspects has far reaching ramifications. Among the many things we should harbor and conserve, perhaps none are more important than our readily available, discontinuous sources of energy.

Coal

Confusion exists as regards coal reserves. The estimation of any underground resource can never be exact. Many estimations of the past have been construed as reference to proved reserves, and many estimates have not been classified as regard to cost of recovery or, for that matter, actual feasibility of recovery. We may be sure, however, that our coal reserves represent our most extensive discontinuous energy resource. Two extensive federal surveys have been made in 1907 and 1936, but due to marked variations which have appeared in recent years, another survey is underway that will be more concerned with the practical problem of recoverability. We are currently uncertain of our potential, therefore, and must wait several years for the more comprehensive and complete picture. Table 2[1] gives selected results from the two previous federal surveys.

The appreciable decline in magnitude of estimates between the two surveys may be noted in Table 2.

Various states have made their own surveys with suitable corrections for unrecoverable material, production, and losses. Table 3 presents some comparative results

We have come to believe that our coal reserves are inexhaustible, but even a superficial study indicates wide divergence of estimated reserves from the availability viewpoint. Estimates vary from 200 to 1500 years supply as based upon the current total annual energy requirement of the U.S. Probably the actual value lies somewhere between the two extremes. The assumption of even the minimum period of time may result in complacency; however, a few disturbing features are evident.

We can be certain that coal will become more costly to produce and more costly to use. It will come from thinner and less accessible seams in more remote areas. It will have higher ash, more sulphur, and lower heat value.

The weighted average thickness of coal seams has been estimated at 5.3 ft, and, at such thickness, one year's production of coal would exhaust about 120 sq mi. Thicker seams have already been exhausted in the older territories and mining costs are increasing rapidly.

Table 2—Federal Coal Resources Survey[1]

In Billions of Tons of Coal		
State	1907	1936
North Dakota	500	600
Wyoming	424	620
Montana	303	381
Illinois	240	198
West Virginia	231	147
Utah	196	93
New Mexico	164	21
Pennsylvania	134	118
Missouri	40	84
Michigan	12	2

Table 3—Billions of Tons of Coal[1]

State	1936 Federal Survey	State Survey Corrected
Pennsylvania	118	44
Ohio	92	10
West Virginia	147	116
Utah	93	46

Coal transport becomes an ever increasing cost factor as shipping distances increase.

No single coal deposit is known that will provide for large-scale production in an immediate, convenient, and economic manner sufficient for liquid fuel production by synthesis.

Underground gasification may prove feasible without large waste.

About 20 percent of the bituminous coal produced goes to coke. Depletion of coking coal reserves has progressed three times as rapidly as others, and it is generally agreed that a relatively high percentage of exhaustion of coking coal reserves has already been accomplished. Certainly, we should give special consideration to our mis-use of good coking coals in domestic furnaces or industrial steam plants.

Petroleum

Because of the desirable physical state of petroleum products, large scale use has developed to the point where our petroleum reserves are of critical importance. Average production of oil over the world is given in Table 4.

It is evident that the U.S. produces over one-half the oil of the world and consumes the major portion of its production. If we produce as much oil in the future as we have produced in total up to the present, we will be fortunate. A 100-million-barrel field

[1]Exponent numerals refer to References.

Table 4—World Oil Production in Thousands of Barrels Per Day Average[2]

Area	Nov. 1949	Nov. 1950
Western Hemisphere	1932.1	2206.2
Europe and Africa	75.7	87.5
Middle East	1459.7	1900.9
Other Asia	210.3	261.7
Russia and East Europe[a]	859.0	909.1
	4536.8	5365.4
United States	5209.5	5895.0
Total	9746.3	11260.4

[a]Estimated

is now an exciting discovery and we shall have to locate the equivalent of about 100 fields of this size to produce as much in the future as we have in the past. Such discovery does not appear probable.

Much could be said about our petroleum situation. Boyd[3], however, has recently presented a concise, graphical summary (see Fig. 1.). The projected demand superimposed upon the most reliable estimates of supply indicates a period of petroleum shortage after about 1955, this shortage becoming increasingly acute with time. Some technologists are more optimistic than Mr. Boyd and there is really no way of knowing whether we shall add 10 or 55 billion barrels of oil to our domestic reserves. These two figures represent the extremes. Even the most optimistic figure, however, does not prolong the life of our domestic resources greatly, and particularly so if we continue the expansion of petroleum use. Such, impending shortage of supply brings several considerations into sharp focus.

In the immediate future we shall probably increase our petroleum imports by an appreciable amount.

To provide our growing motor fuel requirement alone, which was approximately 37 billion gallons in 1949, will, in the not too distant future, become a significant problem.

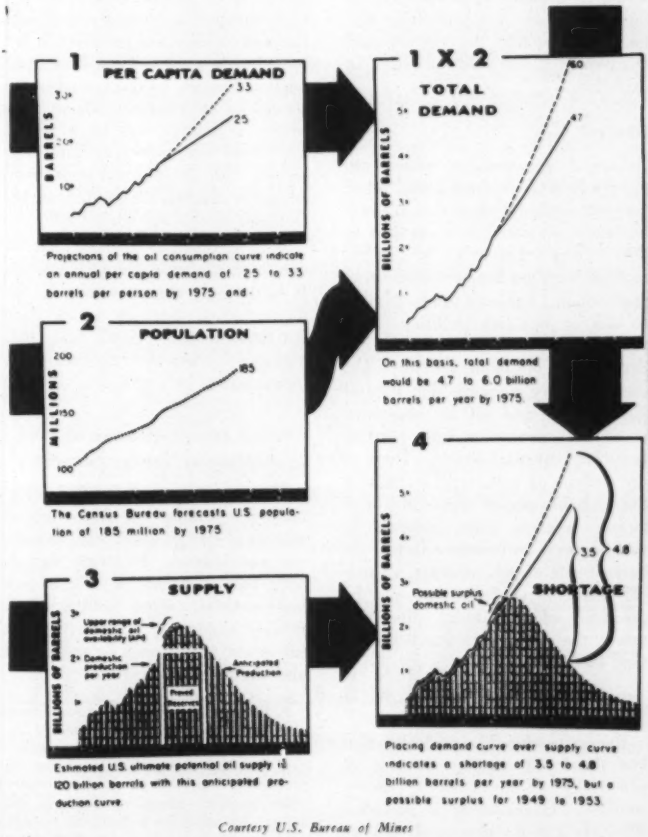
Considering the important uses of petroleum such as for motor fuel, solvents, petro-chemicals, etc., it appears foolhardy to use petroleum as a source of energy for space heating or for transportation motive power when other fuels might be substituted.

Certainly, with regard to our petroleum resources, we have given little attention to the requirements of future generations and have depleted a vital source of energy solely upon the basis of immediate economics and availability, with no thought for the long-time significance of such action.

Oil Shales

Our oil shale deposits are located mainly in the so-called Green River formation as represented by deposits in Colorado, Utah, and Wyoming. The combined results of the U.S. Geological Survey, the U.S. Bureau of Mines, General Petroleum, and a report upon the Naval Oil-Shale reserves indicates a probable 345 billion barrels of oil, although the deposits have not been surveyed completely. This is about 10 times our total petroleum production up to date and, as such, represents a vital, undeveloped potential.

Only a relatively meager sampling program has been conducted upon the shale, considering the quantity and extensive area of coverage. Colorado contains approximately 300 of the estimated 345 billion barrels, yet there is only one sample section for every 39 sq mi. In addition, the oil yield from the shale varies greatly, from traces to as high as 60 gal per ton of shale. The principal costs of mining, transport, and retorting are the same, regardless of the yield; hence there must be some cut-off value below which oil recovery would be improbable. This figure has been more or less arbitrarily set as 30 gal per ton. With such cut-off figure, allowing for mining losses, and with due regard for costs of extraction up


1
PER CAPITA DEMAND
BARRELS
33
25
Projections of the oil consumption curve indicate an annual per capita demand of 25 to 33 barrels per person by 1975 and
2
POPULATION
MILLIONS
200
150
100
185
The Census Bureau forecasts U.S. population of 185 million by 1975
3
SUPPLY
BILLIONS OF BARRELS
Upper range of domestic oil availability (est.)
Domestic production per year
Proved Reserves
Anticipated Production
Estimated U.S. ultimate potential oil supply of 120 billion barrels with this anticipated production curve
1 X 2
TOTAL DEMAND
BILLIONS OF BARRELS
60
47
On this basis, total demand would be 4.7 to 6.0 billion barrels per year by 1975
4
BILLIONS OF BARRELS
35
48
Possible surplus domestic oil
SHORTAGE
Placing demand curve over supply curve indicates a shortage of 3.5 to 4.8 billion barrels per year by 1975, but a possible surplus for 1949 to 1953

Courtesy U.S. Bureau of Mines

Fig. 1—Oil problem in the United States

to a figure as high as four times the current price of competitive crude, it appears that a reasonable reserve of 80 billion barrels may be depended upon.

At current rate of consumption, assuming direct substitution, the oil shale would provide our petroleum needs for approximately 28 years or, assuming minimum projected 1975 consumption figures, for 17 years. It is pertinent to remark that oil from shale presents, as yet, grave difficulties in the production of a suitable quality motor fuel. Judicious use of shale oil to extend our petroleum reserves is feasible, however, and may be an accomplished fact when it becomes necessary to import appreciably larger amounts of petroleum. What the production rate could or would be depends upon so many intangible factors that little more can be said, other than that the potential reserves exist and will, no doubt, be exploited.

Natural Gas

Natural gas reserves which are mainly located in about 2 percent of the petroleum producing fields are variously estimated at from 175 to 400 trillion cubic feet. In the immediate past, gas has been discovered faster than it has been produced, due to lack of pipe line facilities. Currently, gas is near the peak of withdrawal for optimum recovery, but there is every evidence that natural gas is being, and will be, consumed at an ever increasing rate, particularly for industrial power. There is no method of accurately estimating the probable period of useful life of known reserves since increase in rate of use is an unknown factor. At current rate of use, however, an outside expectancy of 65 years may be the order of magnitude. Most certainly, the actual period will be less than the 65-year figure.

Atomic Energy

Energy produced by nuclear fission has developed another concept of practically an inexhaustible energy source. This certainly is not true. We have not yet developed controls to the point where atomic energy can be transformed for domestic or industrial purposes, but the accomplishment is not an impossibility. The development of large scale atomic power will come slowly. As with any energy resource, it is dependent upon a *fuel* supply in the form of fissionable material which, like other fuels, is definitely limited in amount and vastly more expensive per unit weight, but undoubtedly competitive per unit of available energy. Problems of control, energy transfer, protection, poisoning, waste disposal, and *breeder* operation must be solved before practical power generation is a reality. Following the development of the technology of the operation, attention must be given to the *fuel* sources of uranium and thorium which are limited in amount, although not entirely known as yet. Undoubtedly the inventory of atomic *fuel* will be classified information for sometime to come. Even most optimistic estimates, however, lead to the conclusion that nuclear fission as a source of energy will be a highly specialized one, having definite limitations and a probable transitory existence comparable to that of petroleum.

It is pertinent to mention that, in one respect, atomic energy is unique. It is the only energy source in the discontinuous category which does not depend upon a fossil fuel, and, accordingly, uses the only fuel which is inorganic.

General Summarization of Discontinuous Energy Sources

There is a mass of detailed information regarding our discontinuous sources of energy which leads to various conclusions. Pertinent factors have been sketched in only a very brief manner. Even from a superficial examination, however, certain important trends may be recognized and stated as follows:

1. The fuels of our discontinuous sources of energy are finite in amount and the *cream* has already been consumed.
2. Our coal reserves are large, but the practicable amounts of recovery depend upon location, nature of bedding, and price. The ultimate, economical, recoverable reserve has not as yet been determined.
3. The physical state of petroleum and its role as a portable fuel has caused marked increase in consumption.
4. Oil from shale is a definite possibility, but its competitive position has yet to be determined.
5. Substitution of one fossil fuel for another appears inevitable with the passing of time and synthetic liquid fuels have a definite role to play in the pattern of the future.
6. Extensive importation of petroleum appears to be an immediate consideration.
7. Ultimate life of our fossil fuels is a conjecture and the depletion of one accelerates the depletion of the others. Substitution through synthesis (as oil from coal) involves tremendous energy losses which further accelerate depletion.
8. Within the coming century, the fuel situation as we now know it will not exist.
9. The stage is set for real consideration of our continuous sources of energy.

Water Power

The most completely developed of our continuous sources of energy is water power. In the minds of many, particularly the people in the favored northwest area, our water resources are considered all-important. Purely theoretical considerations of all rainfall of the earth (average 36 in. per year) raised to a mean land elevation (2400 ft) and wholly utilized, would produce some 360 trillion horsepower-hours per year. This represents approximately 14 times our present total world energy requirements (approximately 12 trillion horsepower-hours for U.S. or 24 trillion horsepower-hours for the entire world). Reliable engineering analyses indicate that perhaps not more than 6 trillion horsepower-hours is a practical maximum which might ultimately be developed. Of this practical potential, only about 0.7 trillion horsepower-hours is currently installed. Table 5 presents the installed and potential water power of the U.S. by drainage areas, and Fig. 2 illustrates the same information.

The total U.S. hydropotential of approximately 105 million kilowatts with production of approximately 500 billion kilowatt-hours per year, amounts to only between 5 and 6 percent of our present energy demand and the percentage will decrease as the total national demand increases with the years. It is also

Table 5—Hydroelectric Power in the United States[4]

Drainage Area	Developed Power Jan. 1, 1960		Potential Power	
	Installations	1000 kwhr/year	Installations	1000 kwhr/year
North Atlantic	89	7,407,400	237	27,879,200
South Atlantic	49	3,420,000	143	15,135,500
Eastern Gulf	17	2,781,000	77	15,580,600
Ohio River	46	15,131,500	142	42,219,400
Great Lakes — St. Lawrence	105	7,817,400	228	25,561,400
Hudson Bay	1	19,000	11	110,300
Upper Mississippi	28	1,944,000	131	5,604,300
Missouri	26	3,406,800	172	44,424,300
Lower Mississippi	8	964,000	99	13,806,700
Western Gulf	9	628,000	61	3,607,005
Colorado	17	6,814,650	99	35,838,350
Great Basin	23	934,000	59	3,810,100
South Pacific	70	12,411,000	259	50,716,000
North Pacific	66	23,432,000	645	193,918,700
U.S. Total	552	87,111,350	2,363	478,209,855

evident that the world contribution of hydro to world energy demands will probably not exceed the 6 percent figure. Accordingly, the major virtue of hydro-electric power is the fact that it is a continuous source of energy, essentially *free* from the standpoint of consumption of our natural resources. As such, it should, in the public interest, be exploited to the maximum extent feasible.

Partial Recapitulation

Thus far, and in a very brief manner, the *usual* sources of energy have been discussed; coal, petroleum, oil shale, natural gas, and atomic energy under the discontinuous sources and hydroelectric power under the continuous sources. Since these six energy sources provide for current usage, it is well to summarize the national production picture as provided by the U.S. Bureau of Mines figures for 1947. The 1947 figures are essentially those of today with an expansion of usage of petroleum and natural gas at the expense of coal as illustrated by the most recent data presented in Fig. 3. Tables 6, 7, and 8 present the 1947 inventory, with Table 6 giving the individual supply figures by production sources. It must be recognized that part of the production from one source in Table 6 is used to produce energy credited to another source such as coal to manufactured gas or crude oil to refineries. It is necessary to correct Table 6 to avoid *double counting*, and the corrected values appear in Table 7.

Table 7 does not present the true picture of the energy which goes to the ultimate consumer because the energy producing industries themselves are large consumers of energy. It is desirable to trace transactions of energy exchange, and account for the quantity of energy consumed in all categories by each energy producing industry, the remainder of such production being that which actually reaches consumers outside of the energy production circle. Table 8 presents such breakdown.

Table 6—Energy Production and Import Data for 1947[5]

U. S. Bureau of Mines Circular 7582
Values 10^{12} Btu

Source	Produced	Imported	Total
Bituminous Coal	16,532	8	16,540
Anthracite Coal	1,556	—	1,556
Crude Oil	11,142	585	11,727
Natural Gas	6,074	—	6,074
Natural Gasoline and Allied Products	610	—	610
Coke Oven	2,589	3	2,592
Manufactured Gas	507	—	507
Refineries	11,531	371	11,902
Electric Utility Power	4,364	22	4,386
Total	54,905	989	55,894

It is evident from Table 8 that energy producing industries themselves consume an appreciable amount of their production. Such consumption does not reflect the additional large allowance which is consumed in energy transport by railroads, tankers, etc.

By detailed procedure of tracing and evaluating energy consumption by groups or commodities, it is possible to apportion the energy distribution as well as to estimate future energy consumption in terms of production trends. The Bureau of Mines studies provide a wealth of detail and only one specific case of a free-enterprise, free-choice economy is presented as Table 9 to compare 1947 energy figures with the projected figures of 1965.

There are many conclusions which could be drawn from the available data, but the most significant appears to be the probable increases in an 18-year period of a 30 percent demand upon our energy resources. Projected, these figures would infer an energy consumption doubling in each 50 years, which, in turn, infers a U.S. energy consumption in the

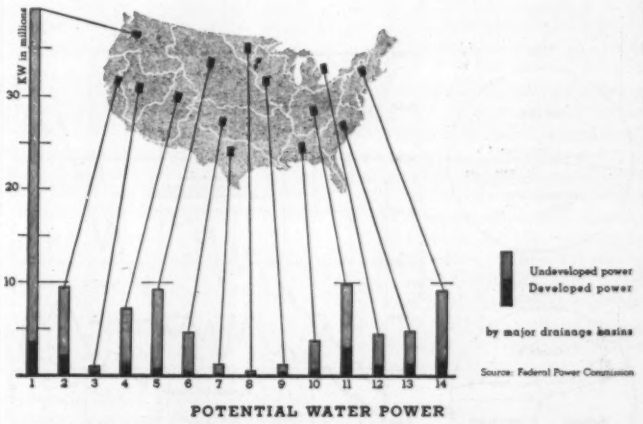


Fig. 2—Potential water power in the United States

1 North Pacific
2 South Pacific
3 Great Basin
4 Colorado River
5 Missouri River
6 Lower Mississippi River
7 Western Gulf
8 Hudson Bay
9 Upper Mississippi River
10 Eastern Gulf
11 Ohio River
12 Great Lakes—St. Lawrence
13 South Atlantic
14 North Atlantic

Table 7—Primary Energy Supply — Production and Import Data for 1947[5]

U.S. Bureau of Mines Circular 7582
Values 10^{12} Btu

Source	Produced	Imported	Total	Percentage Total
Bituminous Coal	16,532	8	16,540	44
Anthracite Coal	1,556	—	1,556	4
Crude Oil	11,142	585	11,727	31
Natural Gas	6,074	—	6,074	16
Natural Gasoline	NP	—	—	—
Coke Oven	NP	3	3	—
Manufactured Gas	NP	—	—	—
Refineries	NP	371	371	1
Electric Power				
Hydro-generated	1,417	22	1,439	4
Fuel-generated	NP	—	—	—
Total	36,721	989	37,710	100

Table 8—Energy Distribution for 1947[5]

U.S. Bureau of Mines Circular 7582
Values 10^{12} Btu

Source of Use	Energy	Percent of Primary Supply
Use and Loss — Energy Producing Industries	5,530	15
Use and Loss — Non-Energy Producing Economy:		
Bituminous Coal	11,250	30
Anthracite Coal	1,563	4
Crude Oil (Exports Only)	278	1
Natural Gas	2,762	7
Coke Oven	2,056	5
Manufactured Gas	371	1
Refineries	10,473	28
Electric Power	3,627	9
Total	37,710	100

year 2000, equal to the current consumption of the entire world, or, say, 25 trillion horsepower-hours per year. It would also appear that in terms of such large demand, real attention should be directed toward substitution of the continuous sources of energy for the discontinuous, if for no other reason than national conservation.

Energy From Vegetation

It is currently, estimated that wood is consumed as fuel to the extent of about a trillion horsepower-hours per year and that the world power consumption could be provided by about 3 million square miles of forest, or about 5 percent of the land area of the earth. Actually, the earth produces about 30 billion tons of vegetation which would be equivalent to some two and one-half times our world energy requirement. The direct use of vegetable matter, however, is difficult from an economic standpoint, primarily because of the labor involved in harvesting and the necessity of storage. As our economy depends more and more upon regulated cropping of forest resources, and dependable supplies of waste wood at fixed locations develop, we will no doubt make better use of wood as a fuel source.

Indirectly, the production of alcohol or other hydrocarbon materials from vegetable matter affords a field of exploitation which gives energy in transportable form as liquid fuel. Subject to the priority of food crops, vegetable matter could, and undoubtedly will, be grown and converted to liquid fuel. One ton of dry wood yields about 84 gal of alcohol. Wood, as coal, can be converted to gas for conventional synthesis to gasoline and other hydrocarbons. From an economic standpoint, it would be more reasonable to convert wood into gasoline upon a strictly thermal basis. Much depends upon uses of alcohol for other than fuel, however, and, in addition, upon the use of lignin, waxes, and other by-products of the wood sugar fermentation process. Both conversions of wood will undoubtedly play a distinct part in the future.

In connection with generalized usage of vegetable substances, photosynthesis research holds possibilities for greatly accelerated rates of growth through the catalytic reaction of carbon dioxide and water. It is highly probable that a constantly renewable source of energy of some magnitude may result from such researches.

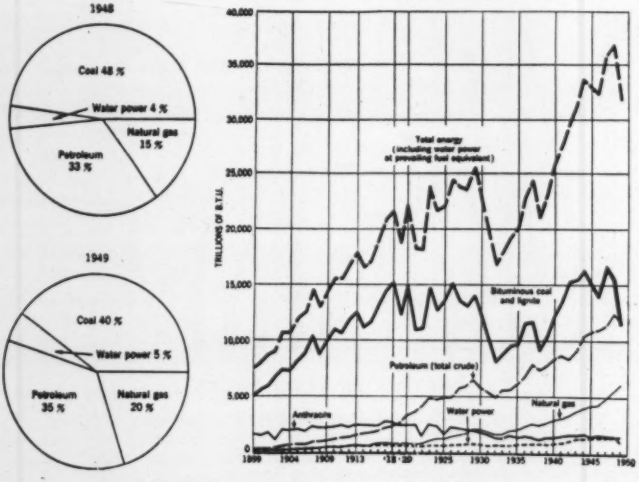


Fig. 3—Energy production in the United States

Solar Energy

Essentially, all energy, continuous and discontinuous, stems from an atomic source, and but for a very few exceptions, is transmitted and captured through solar radiation. The largest energy source is the sun from which we receive only a small fraction of the radiation. Even this small fraction, however, is 10^5 times our total energy requirement. About half of the intercepted radiant energy is reflected back into space by our atmosphere and another third of the remainder by the earth's surface.

Part of the unreflected energy is fixed by plants and utilized in evaporation of water, and the remainder is re-radiated at night. Effective utilization of solar energy is essentially a problem of preventing such re-radiation by trapping the solar radiation in some usable form.

It is quite possible, at very low efficiencies, to convert solar radiation to electrical energy via thermoelectric means and new alloys have recently raised efficiencies to as high as 5 percent. Likewise, photoelectric conversion holds definite possibilities. Primarily, however, solar energy potential is raised by optical systems and several such systems have been projected. High temperature production as well as low pressure power systems are a distinct possibility, and some estimates have been prepared as to costs and the land areas involved. Night storage of solar energy and storage to meet peak demands are difficult but surmountable problems. Direct use of solar heat by solar collectors built directly into dwelling structures has been the subject of extensive experimentation and is entirely feasible as a heating system, particularly since new glasses have been developed to permit higher efficiencies of energy transmission. It is considered that, south of latitude 40, houses can now be designed and built to require no fuel for domestic heat and hot water and that the overall cost over the life of the structure is comparable to that of the conventional dwelling with its yearly fuel bill.

Wind Power

The experiments at Grandpa's Knob, Vermont, and other less comprehensive experimentation have indicated possibilities of air movement as a source of power. Variable wind velocities pose difficulties, with winds below 20 mph being of little practical use, and winds over 30 mph presenting serious structural difficulties. Storage of power for peak demand is a difficulty, and any installation would have to be integrated with an interconnected power grid to be practical. Investment costs have been figured at about $68 per kilowatt.

Table 9—Energy Consumption by Consumers for 1947 and 1965 Estimate[5]

U. S. Bureau of Mines Circular 7582
Values 10^{12} Btu

Consumer	1947		1965		%
	Energy	% Total	Energy	% Total	Increase
Energy Producing Industries	5,531	14.7	8,175	16.8	48
Manufacturing (1939 Census Groups)					
Iron & Steel	3,045	8.1	4,428	9.1	45
Chemicals	1,596	4.2	3,180	6.6	99
Textile	396	1.1	479	1.0	21
Stone, Clay, Glass	899	2.4	1,281	2.6	42
Food and Allied	700	1.9	891	1.8	27
Paper and Allied	654	1.7	865	1.8	32
Nonferrous Metals	481	1.3	867	1.8	80
Other Mfg.	1,220	3.2	1,977	4.1	62
Total	8,990	23.9	13,968	28.8	55
Railroads	3,736	9.9	2,063	4.3	−45
Bunker	803	2.1	935	1.9	16
Household, Commercial & Other Domestic Fuel & Power					
Heat	8,182	21.8	10,846	22.3	33
Power	1,975	5.3	3,559	7.3	80
Motion	4,391	11.7	6,021	12.4	37
Total	14,548	38.7	20,426	42.1	40
Domestic Chemical, Lubes, etc.	969	2.6	1,372	2.8	42
Exports	3,025	8.0	1,600	3.3	−47
Total	37,602	100.0	48,539	100.0	29

Although not of probable great importance, wind power experimentation still continues.

Earth Heat

The earth radiates more heat than it receives from outer space. This heat comes from the hot interior of the earth (variously estimated at from 2,000 to 20,000 deg C) and is about 250 trillion horsepower hours per year. No practical plan has so far been developed to use earth heat, except in those few locations where vulcanism brings high temperatures close to the surface and where volcanic steam is present. The largest installation is in Italy, where about 170 million horsepower-hours per year are generated. This plant has recently undergone extensive expansion. The engineers of the future will perhaps conceive more plausible ideas for the utilization of earth heat than they have in the past, for a large storehouse of energy is present if it can be tapped in a practical and economic manner.

Tidal Power

Tidal power is one of the non-atomic sources of energy, and, if totally harnessed, might provide about half of the total energy requirement of the world. There are, however, only a few points on continental shores which appear to justify installations. Of the dozen or so probable locations, a few are very interesting and the potential appears to justify future plants of some appreciable magnitude at these sites. For example, the Severn River in the British Isles, Passamaquoddy, and the Bay of Fundy, Canada, are distinct probabilities. These three projects alone might produce about 24 million horsepower-hours per year. The absolute practical potential of tidal power as now conceived could not exceed 0.5 percent of our world requirement.

Tropical Waters

Because of the difference in temperature between the surface and depths of tropical waters, a power potential exists which has been the subject of extensive study by Claude. A plant of 7,000 kw capacity is being constructed on the coast of French West Africa, and only recently an expansion of this operation has been proposed. It appears reasonable that supplemental power installations using water temperature differentials will be constructed, but the total magnitude will not be large due to restricted locations. The total generation, however, will probably exceed that from tidal power. It is quite possible that total power from tropical waters might eventually equal that of total hydro at the present time.

Heat Pump

Although it is designated as an energy source, the heat pump or *reversed cycle heating* is a mechanism by which the difference in tempera-

ture between atmosphere and earth is used for deriving power usually as heat energy. Since the heat pump is a mechanism and not a source discussion of it should be limited to a single simple statement. Extensive studies have greatly improved techniques in use of the heat pump. Today both the equipment and ability are available to take advantage of situations in which *invested* energy can be made to yield an increased increment where earth or water heat sources are adequate and the economies are favorable. In the future heat pump installations may yield an increment of energy, perhaps as high as 0.2 trillion horsepower-hours per year.

Conclusions

The foregoing by necessity is a very brief coverage of the subject of energy sources. Combined with the detail of many studies, however, it would appear that certain conclusions are warranted, specifically:

1. With the exception of hydro-electric power, our energy comes from discontinuous sources, the fuels of which are finite in amount.

2. That our economy is expanding in proportion to our energy use, and we can expect greater demands upon our energy sources.

3. That, while there are ample and available sources of energy to provide for our immediate requirements, and while such sources can be expanded to an appreciable degree, they are nevertheless, finite.

4. In the interest of future generations as well as in the interest of true conservation, we should hoard our fossil fuels wherever possible, particularly petroleum.

5. To conserve our fossil fuels infers substitutions of one discontinuous source for another and continuous sources for the discontinuous ones.

6. That there are distinct possibilities of greater development and use of continuous sources of energy which Ayres[1] has estimated as probable within 100 years as shown in Table 10.

7. That energy sources, limitations, and locations may well influence our living patterns through change in architectural design, industrial locations, comparative price of fuels, and the development of more integrated energy systems.

8. In addition to development of new sources of energy, we have much to accomplish by way of improvement in use of currently developed sources through higher efficiencies of utilization, transport, and conversion.

Table 10—Continuous Sources of Energy[1]

Source	Trillion Horsepower-Hours Per Year Probable 100 Years Hence
Vegetation	10.0
Solar Power	20.0
Solar Heating	4.5
Hydroelectric	6.0
Wind	Trace
Heat Pumps	0.2
Tropical Waters	0.7
Earth Heat	0.5
Tides	0.05
	41.9

9. That periodic inventory of our energy resources is just as important as for other natural resources.

10. That we should be willing to pay a premium now in terms of research and development to effect conservation of our *least adequate in amount, but most useful in form* sources of energy. Such research as shale oil recovery, liquid fuels from coal, utilization of vegetable wastes, etc., should continue to receive adequate public support.

11. That we should direct conservation effort preferentially to areas of largest consumption such as space heating and provision of process heat.

12. That, in the public interest, we should eliminate wasteful processes where conservation could be effected by substitution even if such substitution results in a temporary economic disadvantage.

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Council members meet on Sunday, July 1, at the new home of the J. Donald Kroekers. *(L. to R.) Front* — John James, I. W. Cotton, J. H. Fox, Ernest Szekely, G. B. Supple, S. W. Boyd, Miss Dorothy Mildner. *Back* — Lester T. Avery, L. N. Hunter, J. E. Haines, B. H. Spurlock, Jr., N. H. Peterson, R. F. Taylor, C. O. Mackey, E. R. Queer, H. E. Sproull, Dean L. E. Seeley, and A. V. Hutchinson.

City of Roses Meeting Sets Attendance Record

ESTABLISHING A NEW attendance record for a Semi-Annual Meeting of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, 545 members, guests and ladies (and including some teen-agers and children) converged on Portland, Oregon, last month for the ASHVE's "City of Roses" get-together, July 2, 3 and 4. Early arrivals on Saturday, June 30, were given a warm welcome by both the weatherman (the temperature was in the 90's) and their Oregon Chapter hosts, represented by W. Bruce Morrison and his Reception Committee. By Sunday, more comfortable air conditions prevailed and front-page credit was given by one of the city's newspapers to the heating and ventilating engineers for the welcome drop.

The three technical sessions held in the Assembly Room of the Hotel Multnomah were heavily attended and provided some interesting and worthwhile discussions.

Technical Sessions Well-Attended

President Lauren E. Seeley opened the first session at 9:30 a. m., July 2, and after a brief greeting from Chapter President H. W. McKenzie and Bert W. Farnes, General Chairman of the Committee on Arrangements, the first business was the presentation of Amendments to the By-Laws. President Seeley explained that operations and some new developments during the year indicated the need of several revisions so that in accordance with Article IX, ten By-Law amendments were drafted and endorsed by Council. He said that the proposed revisions would be presented, that pertinent changes would be made and if approved, the By-Laws would then be mailed to members and final action would be taken at the Annual Meeting.

H. E. Sproull, Cincinnati, Chairman of the Charter and By-Laws Committee, was introduced and presented the proposed amendments with a brief explanation of the need for each one. He said that with the introduction of curricula on heating, ventilating and air conditioning it was desirable to provide for acceptance of students taking these courses, so that a revision of Article II, Section 3 (d), (e) and (h) was necessary in order that Council could approve courses in such schools.

To clarify the provision in Article II, Section 7 on payment of dues by

resigning members, it was restated as follows: If the dues of the resigning member shall have been paid to the end of the quarter-annual period immediately preceding the date of the receipt of resignation, his resignation shall be accepted.

As it was desirable to have the dues rate for students established by Council and apply on a school year basis instead of on a calendar year basis as provided for other membership grades, appropriate changes were offered in Article II, Section 8 and Article IV, Sections 3 and 4. A special Journal subscription arrangement was also included.

The proposed amendments to Article VII, Sections 3(c) and (h) make the Chairman of the Committee on Research an ex-officio member of the Guide Committee and all Technical Advisory Committees.

It was the opinion of the Chapter Relations Committee Chairman, concurred in by Council, that the committee members should have one year terms instead of three year terms because of the possible difficulty in applying the regional provision.

Council also proposed that the Public Relations Committee be made a general committee of the Society.

Mr. Sproull said that in the opinion of Council the need had developed for these By-Law amendments and recommended that they be submitted to the membership.

President Seeley called for discussion and several questions were asked but no changes in the amendments as written were suggested.

President Seeley announced the appointment of the Resolutions Committee, with the following membership: Harry Stevens, Hutchinson, Kans., C. M. Burnam, Jr., Chicago, and R. T. Kern, Fitchburg, Mass.

The first technical paper announced by President Seeley was Aluminum Ceiling Panels for Heating and Cooling, by E. S. Howarth, S. C. Huddleston, and R. M. Koch, which was presented by Mr. Howarth. The paper, Laboratory Studies of the Thermal Characteristics of Plaster Panels, by C. M. Humphreys, C. V. Franks, and L. F. Schutrum was given by Cyril Tasker, Director of Research of the ASHVE. The paper, Optimum Panel Surface Distribution Determined from Human Shape Factors, by F. W. Hutchinson and Meil Baker, was read in summary by A. V. Hutchinson. The report of the Committee on Research was presented by I. W. Cotton. The paper, Barometric Draft-Control Analysis, by H. B. Nottage, D. W. Locklin, and R. G. Huebscher, was presented by title.

Ernest Szekely, First Vice President, presided at the technical session on Tuesday, July 3, at which the following papers were presented: Control of Air Streams from a Long Slot, by Alfred Koestel and Chia-Yung Young, presented by Professor G. L. Tuve; Pressure Losses of Take-Offs for Extended-Plenum Duct Systems, by J. W. Holl, S. F. Gilman, R. J. Martin, and S. Konzo, presented by J. R. Jamieson; Warm Air Perimeter Heating — Heat Emitted from Floor Surface, by J. R. Jamieson, R. W. Roose, and S. Konzo, also presented by Mr. Jamieson; and Furnace Thermal Efficiency Determined from Flue and Jacket Loss, by H. L. McPherson, K. L. Badger, and W. S. Zawada, presented by title.

Reg Taylor, Second Vice President, presided at the technical session on Wednesday morning, July 4. The paper, Heat Pump Application to a Newspaper Plant, by J. D. Kroeker, J. H. Bonebrake, and J. A. Melvin, was presented by Mr. Kroeker. The paper, Two-Year Performance of a Heat Pump System Furnishing Year-Round Air Conditioning in Modern Office Building, by Philip Sporn and E. R. Ambrose, was presented by Mr. Ambrose. The paper, Climatology as an Aid in Heat Pump Design, by G. S. Smith, was presented by the author. The paper, Heat Requirements of Buildings, by C. W. Signor, was presented by title.

Registration at the Multnomah — a record high set for ASHVE Semi-Annual Meetings

One of the busiest groups at the meeting — the Nominating Committee *(L. to R.) Front* — P. J. Marschall, E. H. Langdon, Arthur Hess, William Wallace, P. R. Achenbach, D. M. Hummel. *Back* — A. E. Stacey, Carey Gamble, Bruce Evans, F. W. Chambers, G. L. Tuve, I. W. Cotton

Busy members and guests board the busses for a tour of the Columbia River Highway *(L. to R.)* Ernest Szekely, Mrs. Graeme B. Supple (background), Mrs. Szekely, Spencer Boyd, Mrs. Boyd, Mrs. Seeley, Dean Lauren Seeley, I. W. Cotton and Mrs. Cotton

Resolutions Committee Reports

After the discussion of the technical papers, President Seeley took the chair and called for a report of the Resolutions Committee, which was read by Mr. Stevens, Chairman, as follows:

WHEREAS, THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS is concluding its highly successful and pleasant Semi-Annual Meeting 1951 in the gorgeous City of Roses of the Great Northwest, and

WHEREAS, the Oregon Chapter through Bert Farnes, the genial general chairman and his many busy beaver helpers, has kept us so enjoyably occupied that the Resolutions Committee has had no time to compose the elaborate and complimentary tributes that the Host Chapter properly deserves, and

WHEREAS, the Oregon Ladies have entertained our wives and daughters so charmingly, and

WHEREAS, the technical papers and discussions have been of a character and quality to reflect great honor and dignity to our Society, and to make an important contribution toward the comfort, health and long life of humanity, and

WHEREAS, President Lauren E. Seeley and the other Officers of the Society have conducted the technical sessions in an expeditious manner so that we might enjoy the culture, beauty and entertainment planned for us, and

WHEREAS, Portland has extended us such a hearty welcome, and

WHEREAS, our headquarters hotel, the Multomah, has so successfully avoided "check in" and "check out" queues and reservation confusion, and has through the courteous attention of its staff and its many facilities provided for our every comfort, and

WHEREAS, our vocabularies have been so enriched by Multnomah, Mollala Buckaroo and many other romantic words not commonly encountered,

NOW, THEREFORE, BE IT RESOLVED THAT: We, the members of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, formally, unanimously and vociferously extend a "Thank You" as hearty as our "Welcome to Portland," to the President, Committees and all of the Members of the Oregon Chapter, to Portland, our host city, to the Hotel Multnomah, our headquarters, to the Royal Rosarians who honored President and Mrs. Seeley, to those contributing papers and discussions, to Lewis & Clark for discovering this great Northwest, to our own Society Officers, Committees, press and staff for a mighty fine meeting.

Respectfully submitted,
RESOLUTIONS COMMITTEE
HARRY L. STEVENS, Chairman
C. M. BURNAM, JR.
R. T. KERN

The meeting concluded with a rising vote adopting the resolutions of thanks for a record-breaking affair.

The final registration showed members present from 29 states, the District of Columbia, Alaska, Canada and Italy.

Meetings of the Executive Committee and the Finance Committee were held on Saturday, June 30.

Council enjoyed the hospitality of the J. Donald Kroekers at their new home, Peekskill, for the Council meeting, July 1. All members but one were present.

The Nominating Committee held its traditional meeting and just made the salmon bake.

The Chapters Conference Committee held a short meeting, at which Chairman J. R. Vernon presided, to discuss chapter operating problems. The meeting was addressed by President Seeley, Howard Sproull, Treasurer, and John Haines, Chairman of the Chapter Relations Committee.

Busy Schedule of Entertainment

In addition to setting a new registration record for an ASHVE summer meeting, last month's gathering was one of the busiest. Well-attended technical sessions were run close to schedule, but left members no more than the necessary few minutes to get from one event to the next due to the extensive and enjoyable entertain-

Heating Men Study Average Man Shape

The pleasing diversity of human shapes may be an aesthetic joy to the man in the street but it's a pain in the neck to science.

Heating, ventilating and air conditioning engineers who have tried for years to evaluate the effect variation in the shape of the human body has on energy received from heated or cooled walls, floor and ceiling areas have found the complex curves of the human body a technical obstacle that seems insurmountable.

However, it now appears from experiments conducted by two professors of mechanical engineering that the human shape factor of a shapely show girl and average person is practically the same.

Results of experiments made by Professor F. W. Hutchinson of the University of California and Baker of ntucky in my to de- or of the losed here

ability of markedly s, the en- fortunate nymously- e 10 sub-

jects collectively representing extremes (for 95 per cent of the population) of variation in height, width, depth, position of center gravity and maximum of local projection of the clothed human figure in profile and full-face view."

ing of the American Society of Heating and Ventilating Engineers. More than 300 are attending the sessions which will run through Wednesday at the Multnomah hotel.

All Het Up

A convention assembled Sunday in the cool confines of the Multnomah hotel. Thursday, Friday and Saturday the same confines were scorching hot.

Name of the group convening: The American Society of Heating and Ventilating Engineers.

Experts Plan Heating Tests

The best way to heat and ventilate modern American homes —that's what a new laboratory in Cleveland will try to find when it opens this summer, according to L. W. Cotton, Indianapolis, who addressed the opening meeting here of the American Society of Heating and Ventilating Engineers Monday.

Cotton, who is chairman of the society's research committee, said that the new $70,000 environmetal lab will be able to duplicate weather conditions accurately. Effects of heating materials on houses during zero degree weather or at temperatures of 100 or more degrees will be tried there.

Nearly 500 delegates and their guests from the United States and Canada were present Monday morning at Hotel Multnomah when H. W. McKenzie, Portland, president of the Oregon chapter, welcomed the guests.

Dean L. E. Seeley of the School of Technology at the of New Hampshire, er the group as na- dent.

so told the ASHVE iety has planned an- chamber at the re- navy to weigh the temperature on the y. This chamber, he e used for research of cloth

omplain dmitted ngineers go, and er sleep ms en found with chi temp ght. warth

Italian Here For Heating Group Meet

An early arrival here for the semi-annual meeting of the American Society of Heating and Ventilating Engineers, and probable holder of the long-distance record for those attending is Dr. Aldo Gini of Italy.

Set to run through Wednesday, the meeting opens Monday at the Multnomah hotel, where all sessions will be held. Attendance is expected to top 300.

Founder of a system of panel heating widely used in Europe Dr. Gini has been a member of ASHVE 19 years.

* * *

HE DESIGNED the first large heat pump installation in Europe in 1937, a 4 million BTU unit installed in the Milan Savings bank. He says there are many such installations in Europe now.

Heating, ventilating and air conditioning are making great strides in Italy, he reports, after coming almost to a complete stop during the war.

Although Italian planning air conditioning is good, he says his country depends on the United States for controls and pressors.

* * *

THE VISITOR calls Am "the only hope for the sal of civilization. Italy under the American situation we said. "Italians formed friendship with America ing the occupation follow war, and have a great ad for them."

Technical sessions held each day with the the nominating comm Tuesday afternoon.

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Fuel Sources on Way Out, OSC Dean Tells Engineers

Atomic energy, like oil, probably is on its way out while still coming in, Dean G. W. Gleeson said Tuesday.

"Real consideration" must be given to developing continuous sources of energy, Gleeson, of Oregon State college's industrial arts

more expensive to mine, may last another 200 to 1500 years.

Oil shortages will begin about 1955 and grow increasingly acute.

Oil shales of the United States contain 345,000,000,000 barrels of oil, but will cost up to four times as much as pe- leum to extract, making 80, barrels the reason-

OSC Dean Sees Vast Increase In Energy Use

Use of energy in the United the year 2000 will be tion of

Portland's newspapers carried numerous stories about the ASHVE meeting, and a department store ran advertisements welcoming the Society. One paper gave front-page credit to the influence of the heating and ventilating engineers in ending a heat wave

ment features planned by the Oregon Chapter. Committees were sometimes pressed to complete their work, but were able to do so and still take part in the lighter side of the meeting by specially-arranged transportation facilities when they couldn't make scheduled bus departures.

On Sunday, July 1, some 75 of the out-of-towners enjoyed tours of the city in cars of Oregon Chapter members.

Registration swung into high gear early Monday morning. At 11 a. m. the ladies gathered in the Junior Ballroom of the headquarters Hotel Multnomah for "brunch", at which Barbara Seeley—daughter of President and Mrs. Lauren E. Seeley — was presented with 16 beautiful roses to mark her birthday. About 110 were in attendance at this function.

Group Tours
Columbia River Highway

As the technical session and the "brunch" were ending, 130 members and guests began boarding busses for a tour of the Columbia River Highway — a part of the Old Oregon Trail. Sightseeing stops were made at the peaceful "Sanctuary of Our Sorrowful Mother", at Vista House (which overlooks the broad Columbia), at magnificent Multnomah Falls and at the fish hatchery near Bonneville Dam, where even the grouchy-looking sturgeon p o s e d willingly for the camera fans.

While the sightseers were enjoying the attractions of the Columbia River, 47 golfers—including, it must be said, some non-golfers—competed at the Glendoveer course for the Research, the Eichberg Memorial, and the Paul Bunyan Cups, and other trophies — including a new myrtlewood cup awarded by the Oregon Chapter for the permanent possession of the player having the low gross.

Hawaiian Theme for
Buffet Dinner

That evening, a crowd of 425 attended the Hawaiian buffet dinner and dance at the Multnomah Hotel. Attired "appropriately" (the word must be printed in quotation marks, for not everyone looks well in a grass

Appropriately garlanded guests at the Hawaiian party Monday night included Past President Merrill Blankin, Mrs. Blankin and their daugther Sue, and Mr. and Mrs. Harry Stevens

A group of natives at the Multnomah Hotel — L. N. Hunter dances with his daughter (lower left)

Enjoying the Hawaiian festivities at the buffet dinner are *(L. to R.)* H. S. Dutcher, Ernest Szekely, Mrs. Szekely and D. C. Lindsay

Lawson McCall, executive assistant to Oregon's Governor, spreads the Oregon welcome mat for ASHVE members and guests at Tuesday's luncheon in the Multnomah "Rose Bowl"

skirt or in other variations of Hawaiian costume), the crowd displayed a conviviality that was proportionate to the sound level it created. Hazel Rex and her orchestra played during dinner and for dancing. The scheduled closing hour of the party was extended by popular demand.

Tuesday morning was left open for shopping for the ladies while the men attended the second technical session of the meeting.

Dean Gleeson Speaks at Luncheon

At noon, all gathered in the Multnomah's "Rose Bowl" for the "City of Roses" luncheon, at which Bert W. Farnes, general chairman of the Committee on Arrangements for the meeting, presided. Lawson McCall, executive assistant to Governor Douglas McKay, welcomed the members and guests to Oregon and to Portland, and Donald Sloan, "secretary of state" of The Royal Rosarians, presented Mrs. Seeley with a bouquet of American Beauty roses. To President Seeley he gave a bronze plaque inscribed to identify a "Peace" rose-bush which, he promised, would be received by Dean Seeley at the proper time for planting at his New Hampshire home.

Dean G. W. Gleeson, of the School of Engineering and Industrial Arts, Oregon State College, spoke forcefully and informatively on the subject of "Energy—Choose It Wisely Today for Safety Tomorrow", stressing the need for conservation of America's resources (see page 107 of this issue).

This identification plaque for a rose bush (to be shipped at proper planting time) was presented to President Seeley by Don Sloan, "secretary of state" of The Royal Rosarians

At the luncheon, Dean G. W. Gleeson of Oregon State College stresses the fact that our present sources of energy are exhaustible

Salmon Bake on Mt. Hood

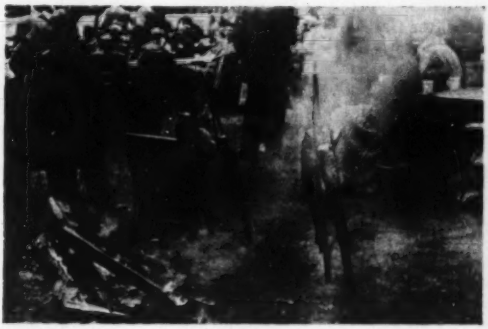
After a few minutes' time following the luncheon, for quick changes into casual dress, busses left the hotel entrance bound for Timberline Lodge and Tollgate Forest Camp on Mt. Hood. Though clouds were heavy and dripping intermittently as the caravan covered the 65 miles to the Lodge, the control of the heating and ventilating engineers over all sorts of air conditions was evidenced at the Lodge's 6000 ft elevation when the skies cleared to allow a view of Mt. Hood's rugged peak.

The ladies enjoy themselves at "Brunch" while the first technical session is in progress

Enjoying the remarks of Toastmaster Bert W. Farnes at the speaker's table are *(L. to R.)* Frank Urban, R. F. Taylor, Dean Seeley, Dean Gleeson (background), Lawson McCall, and Ernest Szekely

Past President Alfred J. Offner corrals dessert for three friends at the salmon bake

Recipe for a tasty dish: After cooking for 2½ hours with the meat side of the fish towards the fire, rotate the vertical spit to cook the skin side for 20 minutes



Radiant heat rays from a blazing pit of logs condition salmon for consumption by hungry ASHVE members and guests

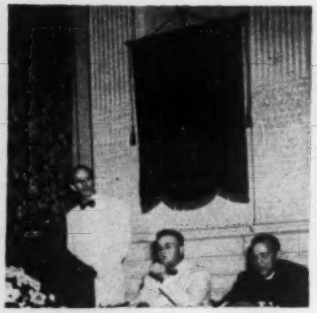
Faruk Konuk deftly assists in the intricate task of baking salmon

At Tollgate, 376 Oregonians and guests witnessed with great anticipation the baking of filleted Columbia River salmon. Twenty slabs of the famed fish had been affixed to stakes and exposed for several hours to the radiant heat rays from a blazing pit of logs, under the direction of A. A. Oliver, Professor of Animal Husbandry at Oregon State College and no mean hand with a salmon. Thirty gallons of coffee and untold quantities of salad and ice cream were consumed with the fish at outdoor tables in the forest, while the "Rhythmaires" quartet entertained and "Little Beaver" (Elbert E. Kelly, of the Oregon Chapter) said a few well-chosen words in his native tongue.

"Bottoms up" at the "Buckaroo" rodeo at Mollala, attended by nearly 200 ASHVE members on the Fourth of July

"Buckaroo" Celebrates Fourth of July

There was no let-up in the busy schedule on Wednesday, the Fourth of July, the last day of the meeting. Following the morning's technical session, a crowd of nearly 200 again boarded the busses — taking along box lunches — for the "buckaroo" or rodeo at Mollala, a well-known, annual, four-day event staged by Mollala's citizens to preserve something of the Old West. Cowboy and cowgirl races, steer-roping and throwing events, trick riding, wild horse saddling and riding and a wild cow milking contest (an extremely complicated method of getting a glass of



Tom Taylor, witty toastmaster at the semi-annual banquet, introduces members and guests at the speaker's table. Seated are President Seeley and "fellow member" Bishop Dagwell

Frank Branch Riley entertains at the banquet as President Seeley (right) and the toastmaster relax

President Seeley addresses the 327 ASHVE members and guests who celebrated the Fourth of July by attending the banquet

milk) held those from the effete East (any place not west of the Rockies) enthralled. That the sport is not without its dangers was evidenced by a cowgirl's broken ankle when her horse fell during a race and certain indignities suffered by Elmer, the clown. One cowboy was thrown from his horse during a cattle roping contest, but the announcer explained he'd been given "a bum steer".

Those who did not attend the buckaroo visited the two large heat pump installations in Portland.

Semi-Annual Banquet at Multnomah

The Mollala busses returned to Portland with their cargoes shortly before the rodeo's closing events to allow time for preliminaries to the semi-annual banquet held that evening in the Grand Ballroom of the Hotel Multnomah and which was attended by 327. Bishop Benjamin D. Dagwell pronounced the invocation, which was followed by the assemblage singing "America" and "God Save the King", for a number of Canadian members attended. When asked later by Toastmaster Thomas E. Taylor for a few words, Bishop Dagwell said he considered himself a fellow-member for he too "had spent his life trying to keep people from suffering from intolerable weather conditions."

Under Mr. Taylor's fast moving and witty toastmastership, Society and Chapter officers and their wives and others at the head table were introduced, J. Donald Kroeker presented a bound volume of the Oregon "Diffuser" to President Seeley, the Oregon Chapter held a brief "meeting" — complete with suitable resolutions — and Sports Chairman Richard Lankow awarded the golf trophies. Merrill F. Blankin, Philadelphia, and Frank Urban, Jr., Oregon, tied for the Research Cup (66 net), and the Oregon Chapter team (Mr. Urban, 66; Andrew S. Weiant, 67; and John P. McDermott, 67) took possession of the Eichberg Memorial Cup. Robert ("Any Beginner Can Do It") Folds, of Oregon, received the Paul Bunyan Cup with a 127 high gross. The Oregon Myrtle Cup went to Erroll A. Murhard, Oregon, for his low gross 79. Other trophies went to J. Albert Freeman, Oregon, William G. Woolley, Oregon, W. G. Warrington, Seattle, R. U. Berry, Bloomfield, N. J., and Ted Jones, of Portland.

St. Louis Next

St. Louis Chapter of ASHVE has plans well under way for the 58th Annual Meeting of the Society, January 28-30, 1952.

Chapter President L. L. Hamig has addressed a cordial invitation to come to "the city that is surrounded by the United States." Bruce L. Evans, Chairman of the Committee on Arrangements, is already on the job spreading the word that it will be to your interest and advantage to meet on the banks of "Ole Man River."

Members will receive further details about the program and hotel reservation forms through the mail during August.

Annual Meeting To Be At St. Louis

Bruce Evans, of the St. Louis Chapter, invited all to attend the next annual meeting of the ASHVE, to be held in St. Louis in January 1952.

Toastmaster Taylor then introduced Frank Branch Riley, mountain climber, explorer and world traveller, and by profession an attorney. Mr. Riley spoke inspiringly and with humor of "The Last West".

The "Rhythmaires" entertained during dinner, and Joe Dardis and his orchestra played for dancing afterward. As the musicians packed up their instruments, some of the members were on their way that night or getting ready to leave the next morning — many to visit other points of interest in the West and others to get back home and to work.

[The Society is indebted to R. C. Chewning, William Wallace, II, and J. Donald Kroeker for the various pictures taken at the semi-annual meeting and shown on these pages.]

DOMESTIC OIL BURNERS — INSTALLATION AND SERVICING

by Charles H. Burkhardt*

This book is a practical, comprehensive manual dealing with the fundamentals of oil burner operation, installation and service.

The writer has given good descriptions of the construction features of typical present-day burners of all types. The functions of various parts are described in detail and explained by use of special diagrams and drawings.

Two chapters are devoted to combustion chamber design. Illustrations of various types of combustion chambers show the relation of flame shape to chamber design.

Control systems for steam, hot water, and warm air heating installations are explained by use of diagrams and cut-away views of individual controls.

The adjustments of burners for efficient performance and the importance of maintaining adjustments by proper servicing are emphasized. Orderly procedures are given for locating troubles when servicing burners. Charts are used to illustrate and summarize the various items which may be the cause of complaints and noises, pollution, odor, soot formation, high fuel consumption, etc.

The book contains 350 pages, is 6 x 9 in. and is bound in cloth. The price is $6.00. It is obtainable from McGraw-Hill Book Company.

ENGINEERING THERMODYNAMICS

by Herman J. Stoever†

The purpose of this book is to present the principles of engineering thermodynamics together with some of the more important applications of these principles. It is intended as a textbook for undergraduate students and is designed for a course covering a full year of instruction.

The book is divided into three parts: Part I is devoted to the First Law of Thermodynamics, Part II to the Second Law, and Part III to applications of the principles and methods developed in the first two parts. The arrangement of the book and the method of presentation are based upon the experience of the author in teaching the subject of thermodynamics.

The liberal use of illustrative problems as well as suggested problems for testing the knowledge of the reader constitute a valuable feature of the book. The arrangement of the book is as follows: Part I — Chapters on: Pressure, Specific Volume, and Temperature; Mechanical Work and Heat; The First Law of Thermodynamics; The Internal Energy and Enthalpy of Fluids; The Analysis of Simple Processes. Part II — Chapters on: Power Cycles and Refrigeration Cycles; The Second Law of Thermodynamics; The Thermodynamic Scale of Temperature; Entropy. Part III — Chapters on: Steam Power Plants; Internal-Combustion Engines; Refrigeration; Compressors; Nozzles and Turbines; Venturi Meters, Flow Nozzles, Orifices, and Pitot Tubes; Air Conditioning.

Published by John Wiley & Sons, Inc. 447 pages, 6 x 9 in. Price, cloth-covered, $5.75.

*Member of ASHVE.
†Professor of Mechanical Engineering, Iowa State College, Ames, Iowa.

R. P. BABCOCK NAMED TO HARVEY-WHIPPLE POST

Raymond P. Babcock, Greenwich, Conn., a member of THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, has been appointed factory representative for Harvey-Whipple, Inc., handling oil and gas heating equipment in the Metropolitan New York area, Long Island, and the State of New Jersey.

Raymond P. Babcock
Greenwich, Conn.

PIPE WELDING MANUAL REVISED

The second edition of the *Standard Manual on Pipe Welding* has just been published by the *Heating, Piping and Air Conditioning Contractors National Association*. The book has been prepared by an editorial committee of 25, representing piping contractors, fabricating shops, trade and technical associations allied to the industry, and manufacturers of pipe fittings and welding equipment.

The Manual is written primarily for the piping contractor, and discusses those parts of the contractor's business that are affected by welding. Certain sections, especially Chapter 4 dealing with piping design, will be of particular interest also to architects and engineers.

The object of this book is to present the most reliable current and authoritative standards, practices, and theory applicable to pipe welding. The scope of the book is shown by the titles of the chapters which are as follows: Welding-A Tool of the Contractor; Description of Welding Processes; Welding Equipment Maintenance; Selection and Training of Operators; Scope of Pipe Welding; Materials and Filler Metals; Testing and Inspection; Code Welding — Procedures — Specifications; Templets and Jigs; Layout and Fabrication Details; Estimating Pipe Welding Costs; Co-ordination of Facilities; Fabricating Shop Organization; Field Welding Shop Organization; Alloy Steels — Chrome Moly — Stainless; Aluminum and Aluminum Alloys; Copper and Copper Alloys; Nickel and Nickel Alloys; Cast Iron; Lead Welding and Burning; Hard Facing Materials; Welding Terms; Welding Symbols; Tables and Formulas (44 pages).

The original Manual was published in 1931. This edition, however, has been completely rewritten by the Committee, which has been working six years in its preparation. John H. Zink, Sr., was chairman of the committee.

The book may be obtained from the *HPACCNA*. 495 pages, 6 x 9 cloth cover. Price $7.50.

ELECT DICKEY LIFE MEMBER

Arthur J. Dickey, Toronto, Ont., Canada, has been elected to Life Membership in the ASHVE, it was announced recently by the Council. Mr. Dickey, who joined the Society in 1921, is president and general manager of the C. A. Dunham Co., Ltd., Toronto, and director of the C. A. Dunham Co., Ltd., of the United Kingdom, London, England.

A. J. Dickey
Toronto, Ont.

Born in Iowa in 1884, Mr. Dickey received a B.S. in Electrical Engineering from Iowa State College. He joined the Dunham Company in Marshalltown, Ia., in 1911, and the following year went to Toronto as manager, later becoming vice president of the firm. In 1946, he was named president.

Mr. Dickey also holds a Life Membership in the *American Society of Mechanical Engineers* and is a member of the *Association of Professional Engineers of the Province of Ontario.*

SURVEY POINTS UP ENGINEER SHORTAGE

The current unfilled demand is for more than 60,000 engineers, exclusive of military needs, even after the 1951 graduating class is absorbed, it was revealed by Carey H. Brown, chairman, Engineering Manpower Commission of *Engineers Joint Council* before the annual meeting of the *American Society for Engineering Education*, June 28, in East Lansing, Mich.

The figures were taken from a joint report of the Statistical and Education Committee of the Engineering Manpower Commission dated June 20, 1951 and covering a survey made in the month of June.

The Engineering Manpower Commission was established by the *Engineers Joint Council* in response to a request from the Manpower Office of the *National Security Resources Board* in September, 1950 *to prepare a program for the most effective utilization of engineers in the national effort and make recommendations as to how such a program could be best administered.*

NAFM ELECTS J. M. FRANK

John M. Frank, president, Ilg Electric Ventilating Co., Chicago, Ill., and a Life Member of the ASHVE, was elected president of the *National Association of Fan Manufacturers* at a meeting of the Group on June 6 in Niagara Falls, Canada. The *National Association of Fan Manufacturers* is comprised of 12 prominent companies functioning nationally in the manufacture of ventilating fans, centrifugal fans, unit heaters, and air conditioning equipment.

J. M. Frank
Chicago, Ill.

TRANE HONORED BY WISCONSIN

Reuben N. Trane, member of the ASHVE and president of The Trane Co., LaCrosse, Wis., was the recipient of a citation awarded by the College of Engineerng, University of Wisconsin, at the school's annual Engineers Day Dinner, May 4 in Madison, Wis. The citation was for his *leadership, ingenuity, engineering skill, and many significant contributions to development of better living conditions.*

ASEE HONORS DR. GIESECKE

Dr. Frederick E. Giesecke, New Braunfels, Tex., a Past President and Life Member of the ASHVE, has received the annual award given by the *American Society for Engineering Education* for distinguished service as a teacher of drawing and descriptive geometry. The honor was conferred upon him in recent ceremonies at Michigan State College, East Lansing, Mich.

F. E. Giesecke
New Braunfels, Tex.

Dr. Giesecke, who was president of the Society in 1940 and winner of the Society's F. Paul Anderson Medal in 1942, has long been one of the nation's leading authorities in heating and ventilating.

Professor Emeritus at Texas A. & M. College, Dr. Giesecke retired from that school's staff in 1945 after 59 years in the field of education. Forty-four of those years were spent at Texas A. & M. and 15 at the University of Texas. He is now devoting part of his time to consulting work in heating and ventilating.

IES ELECTS NEW OFFICERS

S. G. Hibben, Montclair, N.J., has been elected president of the *Illuminating Engineering Society*, it was announced recently. Others elected at the same time are: Vice Pres. A. H. Manwaring, Philadelphia, Pa.; Treas. R. F. Hartenstein, Akron, Ohio; General Sec'y. C. C. Keller, New York, N.Y.; Directors G. W. Beals, Meriden, Conn., and J. S. Schuchert, Pittsburgh, Pa.

Summary of Chapter Meetings*

• *BALTIMORE*—May 23, 1951. The meeting was called to order in the Engineers Club and the first business was the reading and approval of the auditor's report. This was followed by a brief talk by retiring Pres. G. B. Priester, in which he expressed his thanks for the cooperation of his fellow officers and the committee chairmen and concluded by giving a brief resume of the past year's programs and activities.

The election of officers was then held with the following results: *president*—W. P. Flanigan; *vice president*—E. R. Kent; *secretary*—F. M. Hewitt; *treasurer*—J. K. Wolford; *board of governors*—G. B. Priester, N. L. Spinelli and John Engalitcheff, Jr.

J. F. Malone introduced the speaker of the evening, John Engalitcheff, Jr., president of Baltimore Aircoil Co., Inc., Baltimore, Md., and a member of the Baltimore Chapter. Mr. Engalitcheff spoke on *Design, Theory, Construction and Operation of Cooling Towers.* In his address, he discussed the effect of the following items: city water conditions, air pollution, metals used in construction, purging non-condensables, and the action of minerals and electrolysis in various systems. Following the presentation, a question and answer period was conducted. Attendance 35. Attendance ratio 0.35.

• *CINCINNATI*—May 24, 1951. Pres. E. W. McNamee called the meeting to order in the Terrace Park Country Club, and the minutes of the April meeting were read and approved. K. B. Little of the nominating committee read the slate of nominees for 1951-52 officers and the following were elected: *president*—J. J. Bechtol; *vice president*—H. E. Russell; *secretary*—R. C. Beineke; *treasurer*—F. W. Wilson; and *board of governors*—A. H. Gerdsen.

President McNamee spoke briefly on the activities during his term as president and expressed his thanks to the various committees for their cooperation. Mr. Bechtol then presented the past president's pin to Mr. McNamee, and the meeting was turned over to the new officers. Attendance 77. Attendance ratio 0.70.

• *DELTA*—May 8, 1951. Theodore Offner was elected *president;* Walter Cooke, *vice president;* H. L. Salaun, *secretary;* C. V. Bankston, *treasurer;* and L. R. Maxwell and C. S. Woodruff, members of the *board of governors;* at the Chapter's regular monthly meeting in the New Orleans Athletic Club.

Chapter business covered prior to the election included reports by Messrs. Cooke and Bankston, and R. K. Goode, and a discussion about arrangements for the proposed meeting with the Shreveport Chapter. President Elizardi reported that a formal invitation had been extended to the Shreveport group and that the approximate attendance figure would be known within a short time.

President Elizardi thanked the various committees and their membership for their contributions to the continued success of the chapter during the past year. He then turned the gavel over to new President Offner, who, in turn, presented Mr. Elizardi with an engraved pen and pencil set and thanked him in behalf of the chapter for the fine job done by the previous administration. Also cited for a job well done was Chapter Delegate, J. S. Burke.

• *INDIANA*—April 27, 1951. The meeting was called to order by Pres. C. F. A. Locke in the Construction League Building, Indianapolis, Ind., and the guests were introduced. President Locke announced the death of J. G. Hayes, Life Member of the Society, and appointed a committee to prepare a resolution in connection with Mr. Hayes' passing.

An auditing committee was then appointed as follows: E. C. Helwig, J. W. Jackson, and A. O. Roche, Jr. The report of the nominating committee followed and President Locke announced that the election of officers would be held at the May meeting.

At this point, the meeting was given over to a panel discussion on air pollution, S. E. Fenstermaker, Sr., acting as moderator. Panel members included: Jesse Amon, chief operating engineer, Indianapolis General Hospital; C. A. Mingle, air pollution director, City of Indianapolis; M. A. Tuttle, engineer, Associated Bituminous Coal Producers; T. R. Davis, vice president, engineering, Ammerman, Davis & Stout, Inc.; and Robert Wolfe, formerly combustion engineer, City of Indianapolis.

Mr. Mingle read excerpts from the annual report of the Air Pollution Department and gave a resume of the policies, problems, and accomplishments of the department.

Mr. Wolfe stated that his studies had shown that industrial plants were not responsible for the majority of the fly-ash in the air, but that a very large percentage of it was derived from railroads and street dirt.

Mr. Amon declared that his experiences had definitely proven that smoke elimination was profitable from an operating cost viewpoint. He further stated that most violations among the larger plants were due to careless and inefficient operators.

Mr. Tuttle expressed the belief that all soft coal burning equipment should be mechanized. It was his opinion that industry is responsible for the emission of practically all fly-ash and that smoke may be traced to the small user.

*Note: The attendance ratios shown represent the membership attendance divided by the chapter membership. These ratios will be useful as a partial indication of interest shown by local chapter members in various types of subjects programmed by the various chapters and may be useful in deciding on subjects for chapter meetings.

Mr. Davis commented upon the responsibility of consulting engineers and contractors to design and install efficient plants. Attendance 47.

• *INLAND EMPIRE*—May 25, 1951. The meeting was called to order by Pres. W. C. Vradenburg in the Spokane Hotel and the minutes of the previous meeting were read and approved. The officers and various committee chairmen then gave their reports and all were accepted.

F. W. McCarthy of the Oregon Chapter gave a short talk on the Society's Semi-Annual Meeting to be held in Portland, and invited all to attend.

L. E. Marque introduced the guest speaker of the evening, L. E. Seeley, president of the Society and dean, College of Technology, University of New Hampshire, Durham, N.H., who spoke on *Engineering With a Human Touch*. Attendance 27.

• *KANSAS*—May 8, 1951. Members and guests met in the Rose Room of the Broadview Hotel for a social hour, followed by dinner at 7:00 p.m. Pres. R. F. Bauer called the meeting to order at 8:00 p.m. and members introduced themselves and their guests. The minutes of the last meeting were read and approved, along with the treasurer's financial report.

The speaker of the evening was Charles Neeson of the Airtemp Division, Chrysler Corp., Dayton, Ohio, who gave an interesting talk on the construction and performance of high speed compressors. The discussion was illustrated with slides, and was followed by a question and answer period. Attendance 30. Attendance ratio 0.38.

• *MANITOBA*—April 25, 1951. After Pres. C. M. Fleming called the meeting to order in the Fort Garry Hotel, and introduced the guests of the evening, the minutes of the previous meeting were read and approved. The nominating committee then presented its slate of nominees for officers for the year 1951-52. A committee, consisting of A. K. Piercy, Einar Anderson, and J. F. Bertram, was appointed to take charge of plans for the May meeting, scheduled to be a season-ending party.

The speaker of the evening was D. M. Stephens, deputy minister of the Department of Mines and Natural Resources, Province of Manitoba. Mr. Stephens gave an informative address on the rapidly changing power situation in Manitoba. Attendance 21.

• *MASSACHUSETTS*—May 15, 1951. Election of officers for 1951-52 highlighted the Chapter's regular monthly meeting in the Campus Room of the Graduate House at M.I.T. Elected were: John Bonner—*president;* G. B. Torrens—*vice president;* L. R. Geissenhainer—*secretary;* A. L. Hare—*treasurer;* and W. J. Ahearn, G. D. Fife, and Mr. Hare—*board of governors.*

After thanking the chapter and officers for their cooperation during the past year, retiring Pres. D. W. Blair turned the meeting over to Mr. Bonner, who introduced the evening's guest speakers, members of the Massachusetts Wing of the Civil Air Patrol. They were: Major Calvin Tilden, Bedford Airport; Past Commander Scottie Mitchell; Lt. Allston Farnsworth; and Sgt. Earle B. Lewis.

After showing a film titled *The Civil Air Patrol*, the guests spoke on the Massachusetts Wing and its aims and services to the community. The Civil Air Patrol, they disclosed, is chartered by the Federal Government as a non-profit organization devoted to the general advancement of aviation in all its phases. It organizes public-spirited, air-minded citizens into a volunteer, semi-military organization, trained and equipped to assist in meeting local and national emergencies.

It is engaged in a nation-wide program of public education on such matters and has built up a reserve pool of 100,000 men trained in the fundamentals of aviation. It stands ready at all times to cooperate with the Air Force Reserve, air units of the National Guard, Aeronautics Associations, State Police, The American Red Cross, and similar organizations. It also contributed to special projects, such as air marking, airport development, the survey of dangerous flying areas, the survey and marking of emergency landing fields and the promotion of private flying. the guests revealed in conclusion. Attendance 28.

• *MICHIGAN*—May 29, 1951. The final 1950-51 meeting of the Michigan Chapter was in the form of the traditional Annual Golf Meet, held at the Plum Hollow Golf Club, Detroit. The arrangements were made by G. W. Akers, R. L. Deppman, and E. J. Anderson.

Following the dinner served at the Club House, Pres. C. F. Donohoe called the meeting to order and gave the annual report of the Chapter accomplishments during the past year. This was followed by the presentation of annual reports from the officers and committee chairmen.

The results of the election of officers for 1951-52 were announced as follows: *president*—G. W. Akers; *vice president*—C. A. Strand; *secretary*—R. H. Oberschulte; *treasurer*—E. F. Glanz; and *board of governors*—G. L. Davis, Jr., D. S. Falk, D. L. McConachie and C. F. Donohoe. Attendance 85.

• *MONTREAL*—May 21, 1951. The meeting was called to order by Pres. J. G. Chenevert and the minutes of the previous meeting were read and approved. Among Chapter business covered was the presentation of the ASHVE Award to Noel Paquette of Ecole Polytechnique by President Chenevert. Howard James, winner of the ASHVE Montreal Chapter Award, McGill University Section, was unable to attend because of previous committments, but sent a telegram expressing his thanks.

The guest speaker was D. B. Thomas, manager Air Conditioning Division, Canadian General Electric Co., Toronto, Ont., who gave an interesting presentation on the subject,

Modern Refrigeration Design. Attendance 43.

• *NEBRASKA*—June 15, 1951. Election of officers for 1951-52 keynoted the Chapter's regular monthly meeting in the Omaha Country Club, Omaha, Nebr. Those elected are: K. E. Martin—*president;* S. W. Black—*vice president;* O. J. Smith—*secretary;* and M. K. Rush—*treasurer.* Presentation of the past president's pin to retiring President Colburn was made by Chester A. Carter. Mr. Colburn thanked all those who helped to make the past year successful, emphasizing particularly the work of Program Chairman, M. K. Rush . Mr. Colburn then presented the gavel to incoming President Martin. The remainder of the evening was given to card playing and dancing. Attendance 57.

• *NEBRASKA*—May 8, 1951. Pres. G. W. Colburn called the meeting to order in the Cornhusker Hotel, Lincoln, Nebr. As no Chapter business was slated, President Colburn introduced the guest speaker of the evening, E. F. Snyder, heating engineer, Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., and president of the Minnesota Chapter of ASHVE. Mr. Snyder's talk on *Solar Heat and Its Control* was highly informative, providing comprehensive and up-to-date material on the subject.

Following Mr. Snyder's talk, a colored movie encouraging attendance at the Society's Semi-Annual Meeting in Portland was shown. The meeting adjourned at 9:30 p.m. Attendance 42. Attendance ratio 0.33.

• *NORTHEASTERN OKLAHOMA*—June 12, 1951. The meeting was called to order by Pres. R. F. Shoemaker in Smith's Restaurant. The roll call was taken and the minutes of the preceding meeting were read and approved.

H. E. Degler, technical director of The Marley Co., Kansas City, Kans., was the speaker of the evening. Mr. Degler spoke on *Performance of Cooling Towers* and used slides to illustrate the talk. Following an interesting discussion period, the meeting was adjourned at 9:45 p.m. Attendance 20.

• *NORTH TEXAS*—May 21, 1951. The meeting was called to order by Pres. R. G. Lyford in the Melrose Hotel and the minutes of the April meeting were read and approved. Since no other Chapter business was scheduled, the meeting was immediately turned over to L. S. Gilbert, chairman, program committee, who introduced the guest speaker, C. L. Gaines, vice president and agency director for the Great National Life Insurance Co. of Dallas. Mr. Gaines' address, *What Price Security*, was interesting and well received. Attendance 81. Attendance ratio 0.59.

• *NORTH TEXAS*—April 16, 1951. The meeting was called to order by Pres. R. G. Lyford in the Melrose Hotel, and members and guests introduced themselves. The minutes of the March meeting were read and approved.

C. Rollins Gardner introduced the guest speaker of the evening, L. E. Seeley, dean, College of Technology, University of New Hampshire, Durham, N.H., and president of ASHVE, who spoke on *Engineering With a Human Touch.* In his address, he told of his experiments in which he was both researcher and subject. He then exhibited a part of the apparatus that he had used in his experiments to determine the degree to which inspirated air was humidified and either heated or cooled in the nasal passages before it enters the lungs. The meeting adjourned at 9:30 p.m. Attendance 73.

• *WESTERN MICHIGAN*—May 17, 1951. This was the Chapter's Annual Meeting and was held at the Walnut Hills Country Club in East Lansing.

Following an afternoon of various informal activities, the dinner meeting began at 7:00 p.m. under the direction of Prof. C. H. Pesterfield. The election of the following officers for the year 1951-52 was announced: *president*—V. H. Hill; *vice president*—W. C. DeRoo; *secretary*—H. R. Limbacher; *treasurer*—F. W. Brundage; and *board of governors*—K. E. Robinson, *chairman*, and V. C. Dean. Because the four new officers are associated with firms manufacturing either furnaces, burners, blowers, or registers (the four components of warm air heating) the Chapter felt that it would be interesting to have each man talk on the design of products in his particular field. Each address was extremely well received. Attendance 92.

• *WESTERN MICHIGAN*—April 9, 1951. The meeting was called to order in the Elks' Club, Grand Rapids, Mich., and the minutes of the previous meeting and the treasurer's report were read and approved. Following the presentation of the nominating committee's report, members and guests were introduced.

T. D. Stafford introduced the speaker, Prof. R. R. Tucker, head, Department of Mechanical Engineering, Washington University, St. Louis, Mo. In discussing his subject, *Air Pollution and Smoke Abatement*, Professor Tucker pointed out that air pollution now exists not only in highly industrial areas, but also in areas that formerly were free from such pollution, due to the spreading out of industry. Smoke and fly ash are most objectionable, Professor Tucker said, in admitting that there is no easy solution to the smoke abatement problem. The four main requisites for carrying out a smoke abatement program, in Professor Tucker's opinion, are: (1) adequate legislation, (2) fearless administration, (3) aroused citizenry, and (4) a crusading press. Attendance 76.

STUDENT BRANCHES

• *NORTH CAROLINA STATE COLLEGE*—April 24, 1951. Pres. L. R. Wensil called the meeting to order at 7:00 p.m. in Page Hall of the

College and called for the reading of the minutes of the previous meeting. The minutes were approved as written.

The election of Student Branch officers was held and the following were elected for the fall semester: *president*—Sydney Narvey; *vice president*—Leonard Rubin; *secretary*—E. A. Travis, Jr.; *treasurer*—W. G. Lloyd; and *society reporter*—L. R. Wensil. Attendance 21.

• *UNIVERSITY OF DETROIT*—May 22, 1951. Pres. G. H. Williams presided and called the meeting to order at 8:15 p.m. in the Engineering Building of the University. The minutes of the previous meeting were read and approved. This was followed by the announcement of the newly elected officers, who will serve the Student Branch in the coming fall semester. The newly elected officers are: *president*—G. H. Williams; *vice president*—T. J. Feaheny, Jr.; *secretary-treasurer*—R. H. Drake; and *reporter*—G. E. Sanctorum.

President Williams then introduced Jack Tracy of the Minneapolis-Honeywell Regulator Co., who spoke on electronic and mechanical thermostats and controls. Attendance 18. Attendance ratio 0.77.

ASTM NAMES PRESIDENT

Truman S. Fuller, Schenectady, N. Y., was elected president of the *American Society for Testing Materials* at the group's annual meeting in Atlantic City, N.J., the week of June 18. Others elected included: L. C. Beard, Jr., New York, N.Y., *vice president;* and J. W. Bolton, Cincinnati, Ohio, R. A. Schatzel, Rome, N. Y., E. O. Slater, Los Angeles, Calif., Stanton Walker, Washington, D.C., and F. P. Zimmerli, Detroit, Mich., *board of directors.*

Candidates for Membership

The Society's By-Laws require that all applications for membership or advancement are to be sent to the Executive Secretary and the names of applicants and their references shall be printed in the next issue of the JOURNAL of the Society, or mailed to all members. When the replies are received from references the Candidate's application shall be submitted to and acted upon by the Admission and Advancement Committee as soon as possible.

When the Admission and Advancement Committee has acted favorably upon a Candidate's application and assigned his grade, the Council shall confirm the election of the proposed Candidate for membership. During the past month 51 applications for membership, including 1 student application and 3 advancements have been received and the names of these men and their sponsors are published in the following list.

Members are requested to scrutinize the list with care. The Admission and Advancement Committee, and in turn, the Council, urge members to assume their share of responsibility of receiving these candidates into membership by advising the Executive Secretary promptly of any whose eligibility for membership is in any way questioned.

All correspondence in regard to such matters is strictly confidential, and is solely for the good of the Society, which it is the duty of every member to promote.

Unless objection is made by some member by August 31, 1951, these candidates will be voted upon by the Council. Those elected to membership will be notified by the Executive Secretary immediately after election.

ADAMS, F. G. W., Mech. Draftsman, Toronto Board of Education, Toronto, Ont., Canada. REFERENCES: J. W. Chorlton*, F. R. Cowan*, C. R. Fuller*, F. D. Ledgett.

ANDREWS, R. T., Sales Engr., American Air Filter Co., San Francisco, Calif. REFERENCES: J. R. Kelahan, Jr., E. C. Sanford, R. C. Taylor, R. H. Walpole, Jr.

BECHTLER, H. C., Pres., Luwa AG., Zurich, Switzerland. REFERENCES: Leo deBruyn, Albert Eigenmann, R. A. Goerg, Walter Sennhauser.

BRAGG, F. M., Mech. Engr., Alaska Railroad, Anchorage, Alaska. REFERENCES: Edwin Blair*, W. P. Douglas*, M. E. Drake*, R. D. Hoss.

BROWNLOW, R. L., Pres., Brownlow's, Inc., Winston-Salem, N. C. REFERENCES: C. Z. Adams, R. W. Allen, M. D. Brown, P. L. Guest, Jr.

CONNER, R. E., Sales Engr., Minneapolis-Honeywell Regulator Co., San Francisco, Calif. REFERENCES: C. H. Bazille, G. K. Brokaw, R. C. Cushing, E. F. Dill.

CUMMING, E. K., Mgr., Cumming Galbraith Ltd., Edmonton, Alta., Canada. REFERENCES: R. M. Hardy*, H. D. Henion, C. W. Johnson, D. A. Stott.

DAVIS, E. J., Mgr. and Vice Pres., J. C. Davis, Ltd., Winnipeg, Man., Canada. REFERENCES: W. J. Atkinson, W. C. Boddington, Raymond Martin, A. K. Piercy.

DEANE, DUDLEY, Owner, Dudley Deane, Consulting Engr., San Francisco, Calif. REFERENCES: R. C. Cushing, E. F. Dill, E. C. Fanning, Edward Hill, Jr.

DICKERSON, C. F., Pres., Air Flow Engineering, Inc., Albuquerque, N. M. REFERENCES: Harry Driver*, Frank Dupuy*, R. B. Guest, G. S. Keith.

DUNCAN, J. R., Sales Mgr., Ontario Div., Dominion Bridge Co., Ltd., Toronto, Ont., Canada. REFERENCES: W. R. Blackhall, G. H. Hopper, J. L. Neilans, William Philip.

DUNCAN, W. T. E., Mgr., Commercial Div., Minneapolis-Honeywell Regulator Co., Ltd., Leaside, Toronto, Ont., Canada. REFERENCES: W. H. Evans, J. H. Fox, V. J. Jenkinson, H. R. Roth.

FISHER, A. K., Specification Writer, Lincoln Bouillon & Assoc., Seattle, Wash. REFERENCES: Lincoln Bouillon, L. F. Christofferson, H. T. Griffith, H. M. Hendrickson.

FRANKLIN, E. T., JR., Sales Engr., Minneapolis-Honeywell Regulator Co., Seattle, Wash. REFERENCES: Marius Anderson, D. C. Griffin, K. H. Hanson, F. W. McCarthy.

GALBRAITH, G. H., Sec'y.-Treas., Cumming Galbraith, Ltd., Calgary, Alta., Canada. REFERENCES: H. D. Henion, H. R. Roth, M. W. Shears, E. H. Terrance.

GASKILL, W. H. JR., Sales Engr., J. Edwin Aspinall, Indianapolis, Ind. REFERENCES: M. F. Blankin, Ferdinand Jehle, L. W. McCrea, A. O. Roche, Jr.

GREENLEE, E. A., Control Application Engr., Barber-Colman Co., Rockford, Ill. REFERENCES: C. J. Braatz, S. D. Browne, I. W. Cotton, W. W. Kennedy.

HARROUN, C. W., Jr. Engr., Charles E. Crone Co., Chicago, Ill. REFERENCES:

*Non-Member

C. E. Crone, C. C. Henderson, A. W. Lippitt, F. E. Zimmerman.

HEATON, W. L., Vice Pres., Original Buildings, Inc., Park Ridge, Ill. REFERENCES: C. K. Henriksen, J. J. Philippi, F. W. Riederer, O. G. Ward.

HERMAN, R. W., Sales Engr., Minneapolis-Honeywell Regulator Co., Milwaukee, Wis. REFERENCES: G. L. Larson, D. W. Nelson, F. J. Nunlist, Jr., R. H. Schulz.

HUNT, F. G., Chief Plant Engr., Toronto East General and Orthopedic Hospital, Toronto, Ont., Canada. REFERENCES: T. J. Abbott, S. W. Alexander, R. P. Allsop, Raul Roy.

JENNINGS, J. H., Chief Engr., Air Cond. Div., Mitchell Mfg. Co., Chicago, Ill. REFERENCES: I. H. Cohler*, R. W. Morgan*, C. E. Ploeger*, R. E. Tucker.

KRASNOW, R. A., Sec'y. & Gen. Mgr., Cobra Pipe & Coil Co., Inc., Elmwood, Conn. REFERENCES: J. J. Moore, F. E. Palmer, J. A. Rheault, H. B. Van Zelm.

KRAVETSKY, V. P., Associate Engr., Office of Archts. & Engrs., University of California, Berkeley, Calif. REFERENCES: E. C. Cooley, F. K. Crouch, T. J. Janes, E. C. Sanford.

KRUSE, F. G., Sr. Mech. Engr., Bechtel Corp., Los Angeles, Calif. REFERENCES: J. S. Earhart, L. J. Helms, J. L. McCullough, Laurids Porse*.

LAWSON, W. R., Sales Repr. & Htg. Engr., The Excelsior Steel Furnace Co., Chicago, Ill. REFERENCES: W. J. MaGirl, J. A. O'Daniel, C. E. Owen, J. E. Seymour.

LEWIS, W. M., Branch Mgr., General Controls Co., San Francisco, Calif. REFERENCES: C. E. Larson, R. B. Plass, S. W. Terry, R. G. Tuck.

MINER, S. M., Industrial Sales Mgr., Westerlin & Campbell Co., Chicago, Ill. REFERENCES: R. A. Budenholzer*, H. G. Chapin, J. J. Floreth, William Goodman.

MONTAGUE, GEORGE, Partner, Monty's Home Service, Santa Rosa, Calif. REFERENCES: D. Bell*, G. Hoover*, W. Kell*, M. Lewis*.

MONTGOMERY, C. C., Chief Estimator, Gilmore Air Conditioning Service, San Francisco, Calif. REFERENCES: E. F. Dill, C. E. Larson, J. E. Murray, R. C. Pribuss.

MONTPETIT, GUY, Cons. Engr., Montreal, Que., Canada. REFERENCES: J. G. Chenevert, R. R. Duquette, R. R. Noyes, P. P. Vinet.

MORRISON, W. F., Exec. Sec'y., State Board of Examiners of Plumbing & Heating Contractors, Raleigh, N. C. REFERENCES: M. F. Du Chateau, R. O. McGary, W. H. Sullivan, L. L. Vaughan.

NICHOLS, W. S., JR., Engr., B. J. Lee Co., Memphis, Tenn. REFERENCES: M. H. Ellis, Jr., J. B. Lammons, R. E. Larkin, A. W. Shelby.

*Non-Member

OLSEN, R. B., Resident Engr., Charles S. Leopold Engineers, Philadelphia, Pa. REFERENCES: R. H. Ackermann, F. H. Buzzard, John Everetts, Jr., C. S. Leopold.

RAGER, W. H., Mech. Engr., Victor C. River, Anchorage, Alaska. REFERENCES: Edwin Blair*, W. I. Erikson*, W. W. Fox*, Carl Johnson*.

RANDALL, H. F., Mgr., Randall & Co., Ltd., Winnipeg, Man., Canada. REFERENCES: R. L. Kent, S. Lennox*, D. F. Michie, J. R. Stephenson.

RICHARDSON, I. M., Vice Pres., & Gen. Mgr., Gulf-York, Inc., New Orleans, La. REFERENCES: J. S. Burke, C. B. Gamble, C. W. Lane, Louis Otto*.

ROBERTS, J. F., Engrg. Draftsman, Zumwalt & Vinther, Dallas, Tex. REFERENCES: F. L. Gray, Jr., H. W. Haight, F. L. McFadden, Jr., P. N. Vinther.

SLINN, S. P., Mgr., D. W. Thomson & Assoc., Edmonton, Alta., Canada. REFERENCES: M. C. Dewar*, K. C. Stanley*, D. W. Thomson, G. K. Wynn*.

SMITH, A. H., Engr., George Wagschal Assoc., Detroit, Mich. REFERENCES: E. H. Clark, R. I. Schoof, K. J. Wagoner, W. P. Ziemba.

SMITH, A. X., Branch Mgr., General Controls Co., Milwaukee, Wis. REFERENCES: Robert Hoehne*, Robert Hume, R. L. King, F. J. Nunlist, Jr.

SMITH, T. J., Chicago Dist. Mgr., The Powers Regulator Co., Chicago, Ill. REFERENCES: C. A. Gustafson, W. G. Pennington, H. J. Prebensen, K. M. Stevens.

TACKES, J. M., Civil Engr., Corps of Engineers, Alaska District, Seattle, Wash. REFERENCES: T. J. Connelley*, George Davis*, G. P. Dorsey*, H. F. Mulikin*.

TANNER, C. H., Owner, Tanner Heating Co., Henderson, N. C. REFERENCES: H. A. Bertossa*, E. G. Flannagan*, J. W. Norris*, W. B. Shirley*.

TILLOTSON, F. W., Sales Engr., Syracuse Heating Supply, Inc., Syracuse, N. Y. REFERENCES: F. E. Krell, W. J. Morrow, H. K. Ormsby, Jr., K. T. Sprague.

TOJE, JOHN, Asst. Engr., Shinn-Hutcheson-Claggett, Miami, Fla. REFERENCES: R. J. Clark, E. A. Hussar, Jr., R. P. Kelley, C. B. Smoot.

WALLSTROM, L. L., Prof. Engr., Lincoln Bouillon and Associates, Seattle, Wash. REFERENCES: Lincoln Bouillon, L. F. Christofferson, H. T. Griffith, H. M. Hendrickson.

WILLSON, A. G., Mech. Engr., John B. Parkin Associates, Toronto, Ont., Canada. REFERENCES: M. C. Bailey, J. W. Darling, Ernest Fox, William Philip.

WRIGHT, J. W., Treas., Bennett & Wright, Ltd., Toronto, Ont., Canada. REFERENCES: James Black, A. M. Clark, Ernest Fox, R. S. Maxwell.

ZAHORAK, E. J., Draftsman, Buensod-Stacey Inc., New York, N. Y. REFERENCES: A. C. Buensod, G. A. Dornheim, H. L. Janet, N. S. Shataloff.

STUDENTS

PURDUE UNIVERSITY, Lafayette, Ind. CERTIFIED BY: W. T. Miller.
THOMAS, E. C., JR.

ADVANCEMENTS

FLEISHER, W. L., JR., Engr., Mance Corp., New York, N. Y. REFERENCES: William Caddle, B. H. Lee, M. A. Queenin, D. K. Roberts*.

HERRING, T. N., Engr., Flinn Holley, Inc., Tyler, Tex. REFERENCES: W. R. Barbeck, Herman Blum, Jr., Oslin Nation, J. D. Poythress.

RIDDLE, J. E., Owner, J. Elmer Riddle Co., San Francisco, Calif. REFERENCES: C. E. Bentley, E. F. Dill, H. V. Hickman, T. J. White.

WALTER W. NOBBS
London, England

Walter W. Nobbs, a Life Member of the ASHVE, and a Past President and Silver Medallist of the *Institution of Heating and Ventilating Engineers*, died May 21 in England. He was 82.

W. W. Nobbs
London, England

Mr. Nobbs was well known in England as a consulting engineer in the heating, ventilating, and water supplies field and at one time was Civil Engineer to the British Air Ministry. He served as consulting engineer in the construction of many famous buildings in the British Empire, among them the County Hall in London and the International Municipal Buildings in Shanghai. At the time of his death, he was associated with the firm, W. J. Perkins and Partners, Consulting Engineers, Westminster, S.W. I.

Mr. Nobbs also held memberships in the *Royal Society of Arts* and the *Institute of Mechanical Engineers*.

IN MEMORIAM

James F. McIntire

1882-1951

James F. McIntire, former president of the United States Radiator Corp., and a past president and Life Member of the Society, died June 18 in St. Petersburg, Fla. He was one of the leading figures in the industry and was extremely active in ASHVE work both nationally and in the Michigan Chapter.

Born on July 13, 1882 in Farmer City, Ill., Mr. McIntire was graduated with a B.S. degree from the University of Illinois in 1907. He began his business career with J. S. Farrell and Co., Indianapolis, Ind., as superintendent of the plumbing and heating departments. He then was engaged by the United States Heater Co., as salesman, engineer, and draftsman, remaining with that company until June, 1910, when he joined the United States Radiator Co. His first assignment was on boiler design and test engineering and marked the start of an outstanding career, which included service as chief engineer from 1918 to 1924, as vice president for many years, and which was climaxed in 1945 with his election as president. Mr. McIntire supervised the Corporation's research activities and also served as the firm's representative to I=B=R, assisting in the formulation of numerous codes and regulations. He retired from United States Radiator in 1948, but continued to serve in an advisory capacity. Mr. McIntire was recognized as an authority on cast-iron boiler design, and was one of the pioneers in developing new radiator types.

Mr. McIntire joined the Society in 1914 and served as second vice president in 1937, first vice president in 1938, and president in 1939. In addition, he was a member of the Council for 9 years and served on many committees. Among these were the following:

1918-24 Committee on Code for Testing Low Pressure Heating Boilers

1918-24 Committee to Confer with ASME Boiler Code Committee on Heating Boilers
Committee on Code of Minimum Requirements for the Heating and Ventilation of Buildings
Sub-Committee VII—Heating Boiler Capacity (chairman-1923)
Committee on Code of Heating and Ventilating
Sub-Committee VI—Heating Boiler Capacity (chairman-1924)

1925-31 Guide Publication Committee
Committee on Code for Testing Low Pressure Heating Boilers
Committee to Confer with ASME Boiler Code Committee on Heating Boilers
Committee on Code of Heating and Ventilating
Sub-Committee VI—Heating Boiler Capacity (chairman)
Finance Committee
TAC on Radiation
Executive Committee
Committee on Rating and Selection of Low-Pressure Heating Boilers
Sub-Committee on Load Determination and on Chimney Selection
Advisory Committee on International Heating and Ventilating Exposition
Committee on Research
Executive Committee of Committee on Research
TAC on Radiation—Direct and Indirect
Committee on Definitions
Nominating Committee—Michigan Chapter representative

1932-38 Committee on Research
Executive Committee of Committee on Research
TAC on Gas Heating Equipment
Committee on Chapter Relations
Committee on Code for Testing and Rating Concealed Gravity Type Radiation
Meetings Committee
TAC on Direct and Indirect Radiation with Gravity Air Circulation
Committee on Nomenclature
Finance Committee (chairman-1937 and 1938)
Committee on ASHVE Standard Code for Testing Stoker-Fired Steam-Heating Boilers
Committee on Radiation with Gravity Air Circulation IP-9
F. Paul Anderson Award Committee (chairman-1938)

1939-43 Committee to Study Method of Selecting Society Officers and Council Members
TAC on Radiation with Gravity Air Circulation
Executive Committee (chairman-1940)
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● **PITTSBURGH:** Organized 1919. Headquarters, Pittsburgh, Pa. Meets, Second Monday. PRESIDENT, W. D. Simpson, 646 Shady Dr. E., Pittsburgh 28. SECRETARY, E. H. Riesmeyer, Jr., 231-33 Water St., Pittsburgh 22.

● **ROCKY MOUNTAIN:** Organized 1944. Headquarters, Denver, Colo. Meets, First Wednesday. PRESIDENT, B. H. Spurlock, Jr., Dept. of M. E., University of Colorado, Boulder, Colo. SECRETARY, J. W. Braak, 1250 California St., Denver, Colo.

● **ST. LOUIS:** Organized 1918. Headquarters, St. Louis, Mo. Meets, First Tuesday. PRESIDENT, J. S. Rosebrough, 25 Rosemont Ave., Webster Groves 19. SECRETARY, L. L. Hamig, 1706 Olive St., St. Louis 3.

● **SHREVEPORT:** Organized 1948. Headquarters, Shreveport, La. Meets, Third Thursday. PRESIDENT, S. W. Beaty, P.O. Box 1734, Shreveport 4, La. SECRETARY, W. S. Evans, 614 Johnson Bldg., Shreveport.

● **SOUTH TEXAS:** Organized 1938. Headquarters, Houston, Tex. Meets, Third Friday. PRESIDENT, G. J. Collins, P. O. Box 2463, Houston. SECRETARY, E. G. Floeter, Jr., P.O. Box 6006, Houston 6.

● **SOUTHERN CALIFORNIA:** Organized 1930. Headquarters, Los Angeles, Calif. Meets, Third Wednesday. PRESIDENT, M. C. Greiner, 1599 Club View Dr., Los Angeles 24. SECRETARY, L. B. Davenport, 137 S. Anderson St., Los Angeles 33.

● **SOUTHWEST TEXAS:** Organized 1946. Headquarters, San Antonio, Tex. Meets, Third Tuesday. PRESIDENT, I. W. Wilke, P.O. Box 1154, Austin. SECRETARY, D. E. Locher, Box 949, 224 S. Staples St., Corpus Christi.

● **UTAH:** Organized 1944. Headquarters, Salt Lake City, Utah. Meets, First Wednesday. PRESIDENT, R. H. East, 1086 E. 21st St., Salt Lake City. SECRETARY, D. R. Wilde, 204 Dooly Bldg., Salt Lake City 1.

● **VIRGINIA:** Organized 1946. Headquarters, Norfolk, Va. Meets Third Wednesday. PRESIDENT, J. F. Boyenton, 400 W. 24 St., Norfolk 8. SECRETARY, J. E. Harding, Apt. R-2, St. James Terrace, Newport News.

● **WASHINGTON, D. C.:** Organized 1935. Headquarters, Washington, D. C. Meets, Second Wednesday. PRESIDENT, S. R. Allen, 942 Washington Bldg., Washington 5. SECRETARY, P. H. Louehran, Jr., 4513 49th St., N.W., Washington 16.

● **WESTERN MICHIGAN:** Organized 1931. Headquarters, Grand Rapids, Mich. Meets, Second Monday. PRESIDENT, V. H. Hill, 2111 Colvin Ct., Lansing 10. SECRETARY, H. R. Limbacher, 760 Vine St. E., Kalamazoo.

● **WESTERN NEW YORK:** Organized 1919. Headquarters, Buffalo, N. Y. Meets, Second Monday. PRESIDENT, T. P. Killeen, 374 Delaware Ave., Buffalo 2. SECRETARY, R. E. Lang, 140 Meadow Lane, Kenmore 23.

● **WISCONSIN:** Organized 1922. Headquarters, Milwaukee, Wis. Meets, Third Monday. PRESIDENT, H. F. Brinen, 226 Kenzie Ave., Racine. SECRETARY, L. C. Plaehn, 914 N. Broadway, Milwaukee.

Student Branches

● **COLLEGE OF CITY OF NEW YORK:** Organized 1949. Headquarters, New York, N. Y. PRESIDENT, Seymour Weinberg, 2147 72nd Street, Brooklyn 4. SECRETARY, Benjamin Karp, 524 Berriman St., Brooklyn 8.

● **LOUISIANA POLYTECHNIC INSTITUTE:** Organized 1949. Headquarters, Ruston, La. PRESIDENT, W. G. McMullen, Box 472, Tech Station, Ruston. SECRETARY, R. L. Gorton, Box 184, Tech Station, Ruston.

● **NORTH CAROLINA STATE COLLEGE:** Organized 1948. Headquarters, Raleigh, N. C. PRESIDENT, Sydney Narvey, 5 B Vetville, State College Station, Raleigh. SECRETARY, E. A. Travis, Jr., P.O. Box 3333, Bagwell Dormitory, Raleigh.

● **OKLAHOMA A. & M. COLLEGE:** Organized 1950. Headquarters, Stillwater, Okla. PRESIDENT, O. A. Brynie, 507 Midi, Vet Village, Stillwater. SECRETARY, D. W. Ray, E126 Bennett Hall, Stillwater.

● **OREGON STATE COLLEGE:** Organized 1949. Headquarters, Corvallis, Ore. Meets, First Wednesday after First Tuesday. PRESIDENT, R. J. Kemper, Jr., 645 N. 4th, Corvallis. SECRETARY, J. M. Templer, 720 Kings Rd., Corvallis.

● **PURDUE UNIVERSITY:** Organized 1948. Headquarters, W. Lafayette, Ind. CHAIRMAN, N. J. Kirch, 922 Highland Ave., Lafayette. SECRETARY, T. L. Burcham, 133 Salisbury St., W. Lafayette.

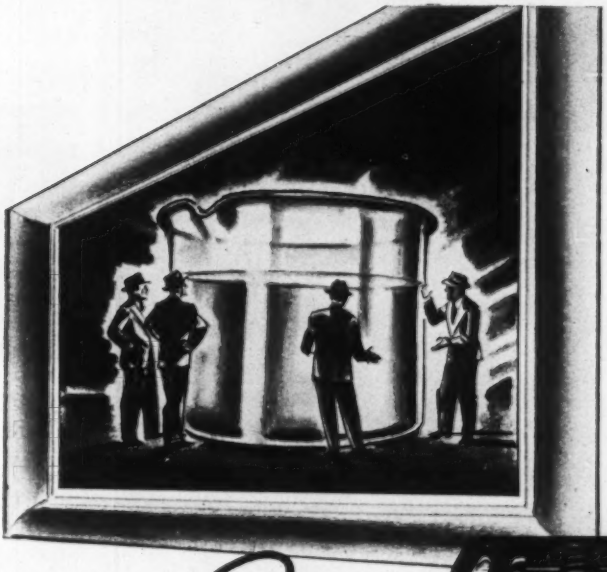
● **TEXAS A. & M. COLLEGE:** Organized 1946. Headquarters, College Station, Tex. Meets, Second and Fourth Tuesday. PRESIDENT, J. O. Kadel, Box 4054, College Station, Tex. SECRETARY, W. C. Haggard, Box 5227, College Station.

● **UNIVERSITY OF DETROIT:** Organized 1949. Headquarters, Detroit, Mich. Meets, First Tuesday. PRESIDENT, G. H. Williams, 18251 Washburn, Detroit 21. SECRETARY, R. H. Drake, 5598 Hurlbut, Detroit 13.

● **UNIVERSITY OF KANSAS:** Organized 1949. Headquarters, Lawrence, Kans. Address mail to Dr. Warren E. Snyder, chairman, Dept. of Mechanical Engineering, University of Kansas.

● **UNIVERSITY OF TEXAS:** Organized 1949. Headquarters, Austin, Tex. Meets, First and Third Tuesday. PRESIDENT, W. A. Cox, 360-D Deep Eddy Apts., Austin. SECRETARY, V. H. Miles, PHP Dorm J, Austin.

● **UNIVERSITY OF TORONTO:** Organized 1951. Headquarters, Toronto, Ont. CHAIRMAN, H. F. Spragg, 35 Harrison Ave., Aurora, Ont. SECRETARY, J. E. G. Blaiklock, 23 Isabella St., Toronto 5, Ont.



when you buy BRONZE VALVES...

BUY THEM BY THE *Gallon!*

What is the *active* life of your bronze valves? On any given application, *how much fluid* will they efficiently control — in gallons of liquid, cubic feet of air, pounds of steam? How long will they last — *in action?*

Make your own comparison — by calling the maintenance or engineering department of your plant. Whether your valves stand idle much of the time — or are in constant use — you'll find that Lunkenheimer bronze valves handle *more* fluids with less maintenance than any other kind. And there are good reasons why . . .

• Exclusive Stemalloy* stems eliminate stem-thread failures. They have actually been tested at more than 300,000 openings and closings — with live steam flowing through the lines. • Body sections are ruggedly proportioned for maximum strength and long life. Wide clearance at thread ends keeps the pipe from jamming against the diaphragm, holds maintenance costs down. • Repacking seats let you repack under pressure — with the valve wide open. • Wrenching surfaces are wide and sturdily built. Danger of twisted body sections and consequent leakage is avoided. Downtime is minimized. • The packing gland, with its thick hexagon lip, can be lifted out with a gentle twist of the wrench. There's no more prying or digging that might cause permanent damage.

Ask your distributor about the other dollar-stretching features of Lunkenheimer 125-lb. globe valves. *And write for Circular 582, describing the line in detail.* Address: The Lunkenheimer Co., Box 360N, Cincinnati 14, Ohio.

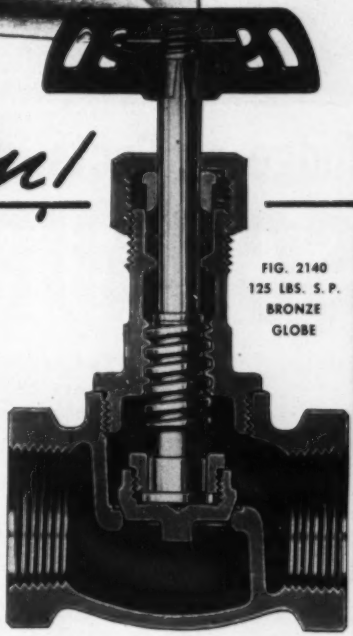


FIG. 2140
125 LBS. S. P.
BRONZE
GLOBE

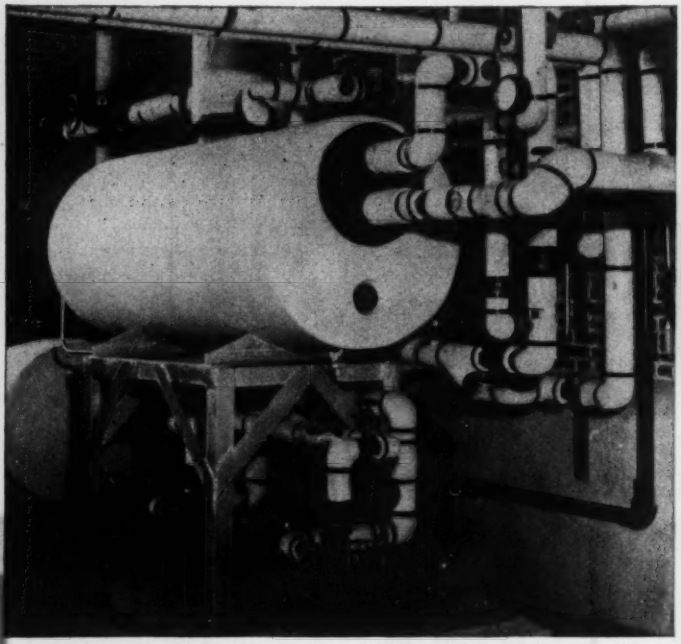
BRONZE • IRON • STEEL

*Patented Alloy

LUNKENHEIMER

THE ONE *Great* NAME IN VALVES

L-451-F



SCHAUB
BOILER RETURN SYSTEMS

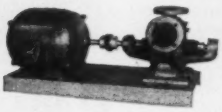
Model S6F Schaub Duplex Deaerator System at the Lawrence Hose Co. (formerly Anchor Thread Co.), Lawrenceville, N. J. Of the 200 H. P. total load, 50% is live steam usage, with 15% returns from a hot water storage heater and 35% returns from high pressure unit heaters.

Judge on Facts...Prove to Yourself —

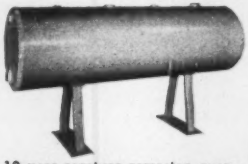
SCHAUB'S YOUR BUY!

Look at Schaub's three outstanding *exclusive features.* Check them point for point with your own experience. Then you'll realize how much more these *plus values* really mean...and why a Schaub System can actually give you more — in low-cost maintenance, improved operating economy . . . and enduring dependability for many years to come. In short, you can't afford to buy a boiler return system until you know the Schaub story . . . then, you won't be satisfied with less.

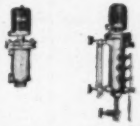
Only* SCHAUB *Has This Exclusive Combination of Features . . .



No more periodic pump maintenance! Schaub Master-Bilt Pumps have new Fleximatic Mechanical seals and permanently lubricated ball bearings. No more water puddles. No more scored shafts. No pump packing or greasing to do — ever!



10-year receiver corrosion guarantee. Schaub engineers worked with leading chemical researchers to develop the Chromosoid lining. You're safe from costly premature replacements. No more rust-clogged systems.



Schaub Systems use only proven super-SAFE Magnetrol pump control and low-water cut off. No bellows to stiffen, no packing to bind, no tricky electrode circuits to fail. Magnetrol's tireless, friction-free magnetic force provides ultra-dependable switching action at all times. BOILER SAFETY KNOWS NO PRICE.

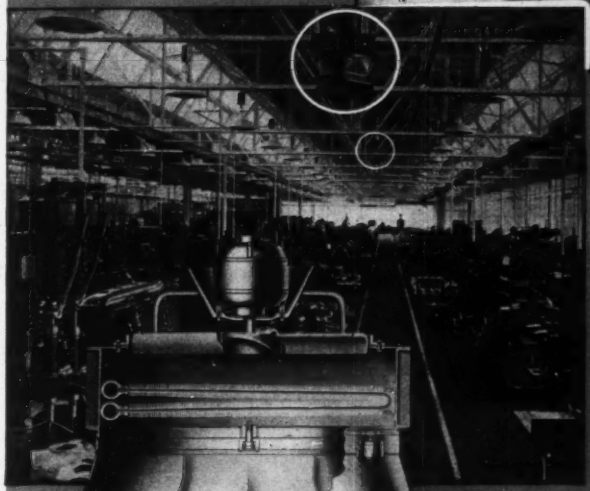
Schaub also builds Patented Heat-Reclaim and Spray-Type Deaerating Systems for exacting requirements from 10 to 1000 Boiler Horse Power. Write for new Schaub Catalog No. 55 which gives more information on all types of Schaub Systems.

FRED H. SCHAUB ENGINEERING COMPANY

2116 S. Marshall Boulevard • Chicago 23, Illinois

THE REVOLVING DISCHARGE OUTLETS FLOOD THE WORKING AREA WITH A BLANKET OF FRESH, LIVE, PLEASANTLY WARMED AIR—

The gentle air motion caused by the constantly changing directions of the heated air from the revolving discharge outlets eliminates the hot blasts and chilly areas common with stationary discharge type unit heaters — creates a refreshing, stimulating atmosphere beneficial to employee morale and productivity.



Successful applications of Wing Revolving Heaters have been made in every type of industrial plant, as well as other buildings with unique heating problems. Get complete information on this modern form of unit heating by writing today for a copy of Wing Bulletin HR-5.

L. J. Wing Mfg. Co. 146 Vreeland Mills Road, Linden, N. J.
Factories: Linden, N. J.; Montreal, Canada.
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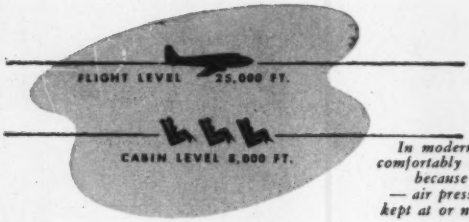
Wing

Revolving UNIT HEATERS



In modern air-liners you breathe comfortably at altitudes of 25,000 ft., because your cabin is "Pressurized" — air pressure inside the plane is kept at or near normal sea level pressure.

Boilers, too, "breathe" easier when their combustion air is "pressurized" using forced draft

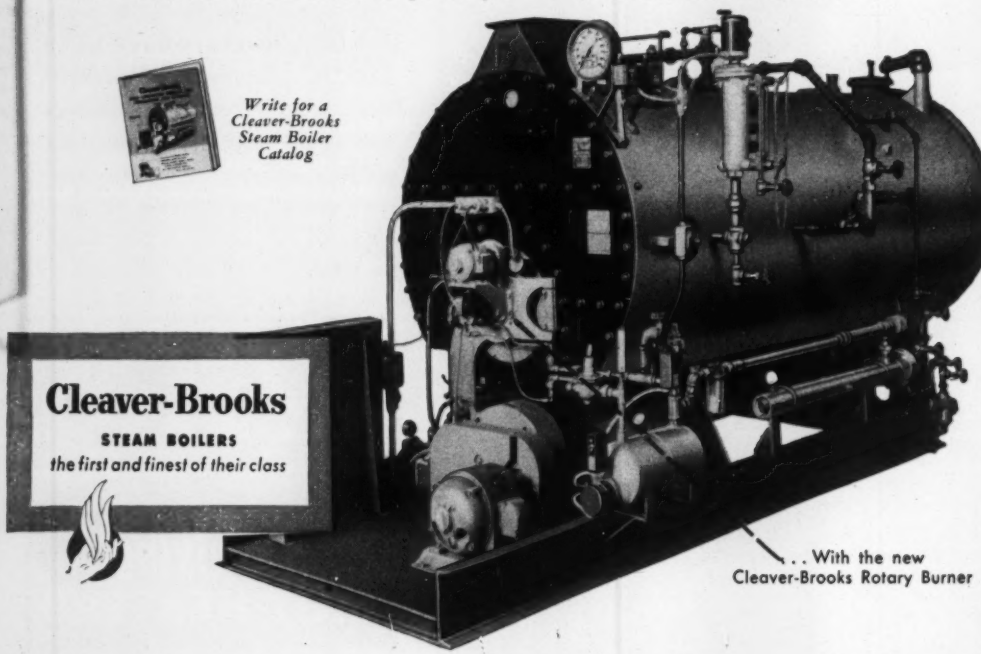
Cleaver-Brooks experience with thousands of steam boilers, of the self-contained type, has conclusively proven these operating advantages of forced draft:

- — because atmospheric boiler-room air is constant in temperature and therefore in density, the weight of air delivered for combustion by a forced draft fan is also constant and always gives proper air-fuel ratio (CO_2) resulting in maximum efficiency and freedom from combustion problems.
- — the electrical load, or power requirement, of a forced draft fan is at a minimum, because the fan handles a lesser volume of air.
- — low fan maintenance and longer fan life with forced draft fans since they operate with cool, clean boiler room air — no problems with high bearing temperatures and corrosion.
- — air is under pressure in the combustion chamber of a forced draft boiler, with no possibility of "diluting" air entering the chamber. Maximum boiler efficiencies are always attained when head plates and casings are tight.
- — lower initial fan cost, better space arrangement, and better appearance are gained because forced draft fans are considerably smaller.
- — casings for forced draft fans are cool — require no insulation — contribute to safer operation and cooler boiler rooms.

Forced draft is one of many reasons why you get a greater return from your investment in a Cleaver-Brooks boiler — a boiler of foremost quality in every detail and with many immediate and long-range cost-saving features. Cleaver-Brooks self-contained boilers are available for oil, gas, combination oil and gas firing — 15 to 500 hp., 15 to 250 lb. p.s.i.

CLEAVER-BROOKS COMPANY
367 E. Keefe Ave., Milwaukee 12, Wis.

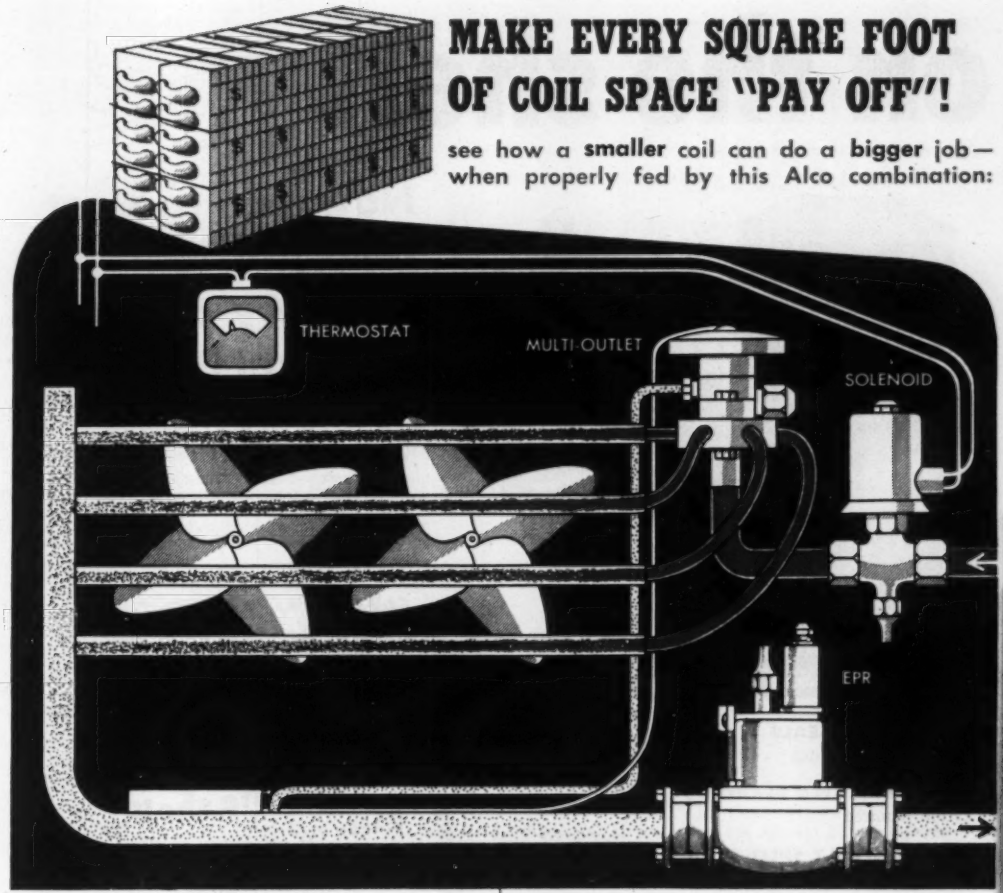
Write for a Cleaver-Brooks Steam Boiler Catalog



. . . With the new Cleaver-Brooks Rotary Burner

MAKE EVERY SQUARE FOOT OF COIL SPACE "PAY OFF"!

see how a **smaller** coil can do a **bigger** job—when properly fed by this Alco combination:



TYPE "TO" MULTI-OUTLET THERMO VALVE—for *individual* liquid metering to each circuit. Assures you of equal distribution under high temperature, low temperature, high load, or low load conditions. Eliminates "hunting and cycling"—gives longer compressor life. Simple "come-apart" construction for easy cleaning and maintenance—without removing valve from line. Multi-Outlet valves available with from 2 to 36 outlets.

M635 SOLENOID—positive liquid stop, thermostatically controlled. Dependable, quiet operation—all internal parts made of stainless materials.

EPR 15—evaporator pressure regulator for product protection against de-humidification or "freeze-up". Maintains constant back pressure.

FOR FURTHER DETAILS, SEE YOUR ALCO WHOLESALER —AND WRITE FOR CATALOG #19.

ALCO

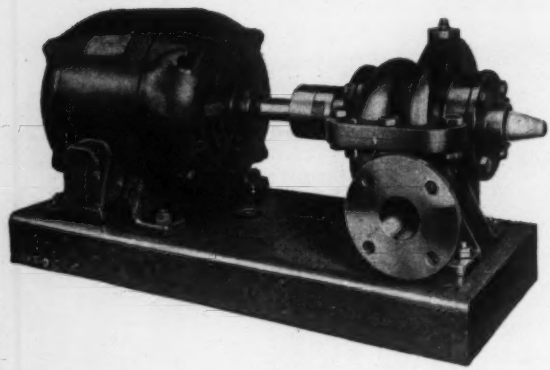
Designers and Manufacturers of Thermostatic Expansion Valves; Evaporator Pressure Regulators; Solenoid Valves; Float Valves; Float Switches.

ALCO VALVE CO.

861 KINGSLAND AVE. • ST. LOUIS 5, MO.

4800

on the shelf



Now you can get immediate delivery of new De Laval GS pumps

A pump "on order" won't help you a bit. Why wait for delivery of a standard centrifugal pump when we have these GS pumps, motors and bedplates in stock waiting to be assembled and shipped.

SIZES: 2½", 3" and 4"
CAPACITIES: To 280 gpm
HEADS: To 75 ft
RPM: 1750
SHIPMENT: *TWO WEEKS*

DE LAVAL GS "EXTRAS"

- **MECHANICAL SEALS** . . . no stuffing box to pack or adjust
- **PRE-LUBRICATED BEARINGS** . . . no lubrication required
- **HORIZONTALLY SPLIT CASING** . . . cover can be lifted without breaking piping connections
- **EASY MAINTENANCE** . . . all parts interchangeable and available from stock
- **PROVEN ROTOR REPLACEMENT PLAN** . . . an added benefit designed especially to eliminate time-consuming maintenance involving individual fitting of spare parts . . . simply install complete rotor assembly in a matter of minutes. Complete interchangeable rotor assemblies are available immediately from factory stock.

Also on the shelf...

SIZES: 2½", 3" and 4"
CAPACITIES: To 400 gpm
HEADS: To 230 ft
RPM: 3500
SHIPMENT: Bare Pump-Immediately
completely assembled pumps, 1 week after receipt of the motor.

GET MORE FACTS...FAST!

DE LAVAL STEAM TURBINE CO., TRENTON 2, NEW JERSEY

☐ I'm in a hurry. Please have an engineer call me.
☐ I'm interested. Please send me literature.

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Company _____
Street _____
City _____ *State* _____

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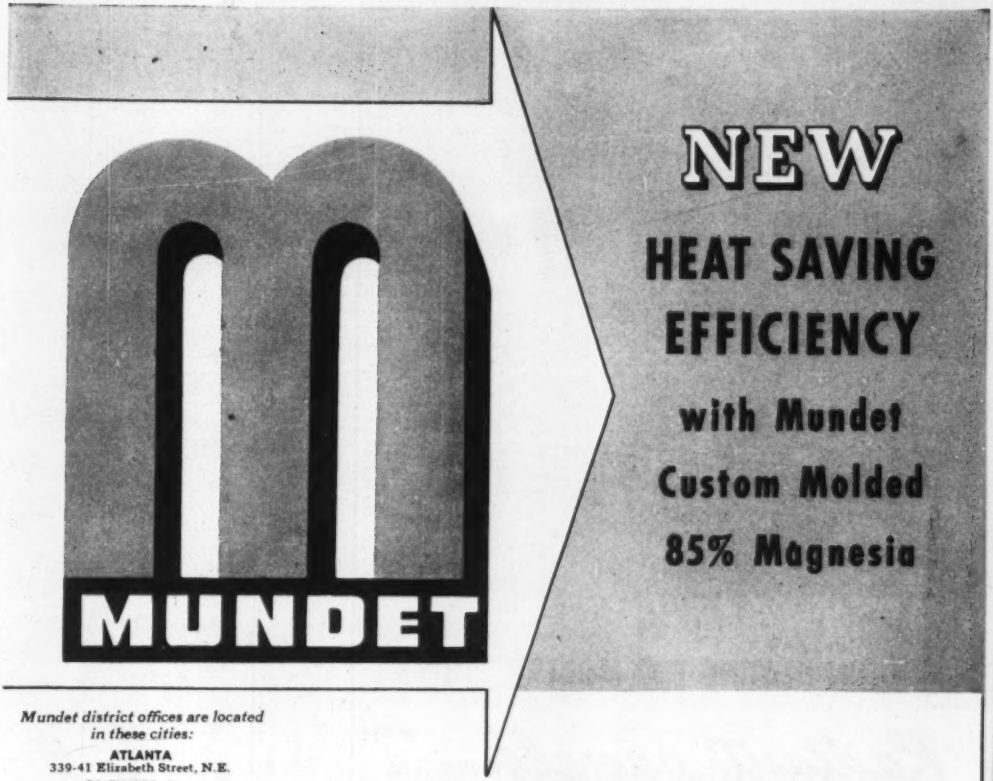
DE LAVAL STEAM TURBINE COMPANY
TRENTON 2, NEW JERSEY

50th DE LAVAL Anniversary



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35 Booth Avenue, Toronto

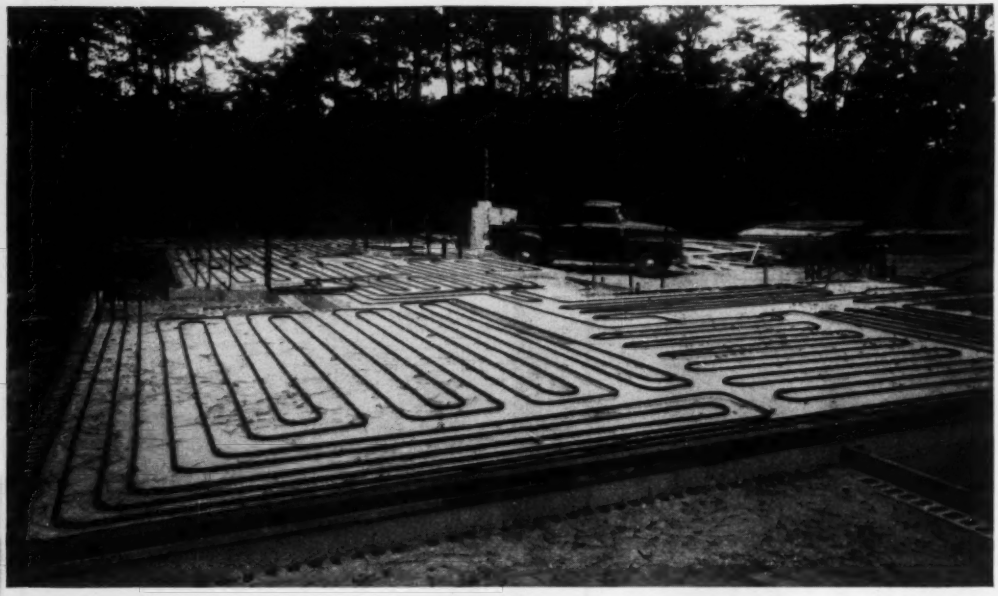
Now available in pipe covering and block insulation, Mundet Custom-Molded 85% Magnesia permits new heat-saving efficiency.

You benefit from these advantages when you use Mundet 85% Magnesia Insulation.

- ***Easier to Apply***
  It cuts easily and cleanly, even without canvas support. No chipping, crumbling or "powdering." Blocks score cleanly.
- ***Lighter Weight***
  Only 11 lbs. per cubic foot density. Even larger sizes and thicknesses are easy for one man to handle.
- ***Controlled Uniformity***
  Precision manufacture on the latest type of equipment insures uniform standards.
- ***More Durable***
  Greater "ductile strength" is built into the insulation. It does not "powder," settle or disintegrate even with heavy vibration. It withstands handling and may be removed and reapplied if necessary.
- ***Does not Shrink or Warp***
  Steam or water leakage does not affect it. It does not shrink or warp even after soaking.
- ***Attractive Smooth Finish***
  No unsightly, inefficient "bagging." Mundet 85% Magnesia insulation retains its neat appearance and effectiveness.
- ***Precision Pipe Fit***
  No spaces are left for the escape of heat. The whole heated surface is snugly enclosed.

Write for specification information and recommendations. Mundet Cork Corporation, Insulation Division, 7207 Tonnelle Avenue, North Bergen, N. J.

INSULATION FOR HIGH AND LOW TEMPERATURE



MODERN HEATING FOR MODERN HOUSING-

Radiant panels of Republic Steel Pipe

● Much of the popularity of modern basementless houses is due to the all-weather comfort of radiant panel heating. Rugged steel pipe heating coils are ideal for these new slab-on-ground foundations.

For years steel pipe has been standard for closed hot water systems. It has given long, trouble-free service . . . has proved you need nothing more costly for radiant panels.

Now, Republic's own *improved* Continuous Weld Process is turning out better-than-ever steel pipe. Republic Pipe is highly ductile, easy to fabricate, especially suited to close coiling and bending. It welds readily, takes threads cleanly and evenly. Uniformly strong, it resists accidental damage. With its coefficient of expansion the same as that of concrete and plaster, it is equally useful in slab, sidewall or ceiling panels. Good for snow-removal systems, too.

Your Republic Pipe Jobber will be glad to give you latest facts about available sizes and current delivery schedules. It is a good idea to let him know your future needs now.

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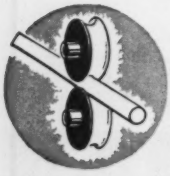


REPUBLIC CONTINUOUS WELD PIPE

Easy to bend, thread and close coil
Easy to weld by all methods
Uniformly ductile
Uniformly strong
Uniformly clean and scale-free
Uniform wall thickness, diameter, concentricity
Economical uniform lengths, extra long lengths
Expansion co-efficient same as concrete and plaster

The Upjohn Co., Portage Road Plant, Kalamazoo, Mich. • *The Austin Company—Engineers and Builders*

UPJOHN'S MAMMOTH NEW PLANT

equipped for clean air by AAF!

THE COMPLETION of Upjohn's superb new plant means better health . . . more active lives for millions of Americans. Here, no expense or engineering talent was spared to obtain the most modern facilities for controlled pharmaceutical manufacturing. Since modern medicines . . . particularly anti-biotics and other sterile solutions . . . exact unusual requisites for sterility and plant hygiene even the air had to be hygienically *clean*.

American Air Filter products were selected to perform this service for the entire plant. Nine distinct types of AAF air filters and dynamic precipitators were used to supply clean air to the many operations and control the dust created by some of them. Though the problems involved both degree of air cleanliness and a wide spread in required volumes—AAF's complete line provided efficient and practical solutions in every instance.

For specific applications see the following pages . . .

American Air Filter

COMPANY, INC.

215 Central Ave., Louisville 8, Ky. • In Canada: Darling Bros., Ltd. Montreal, P. Q.

AAF

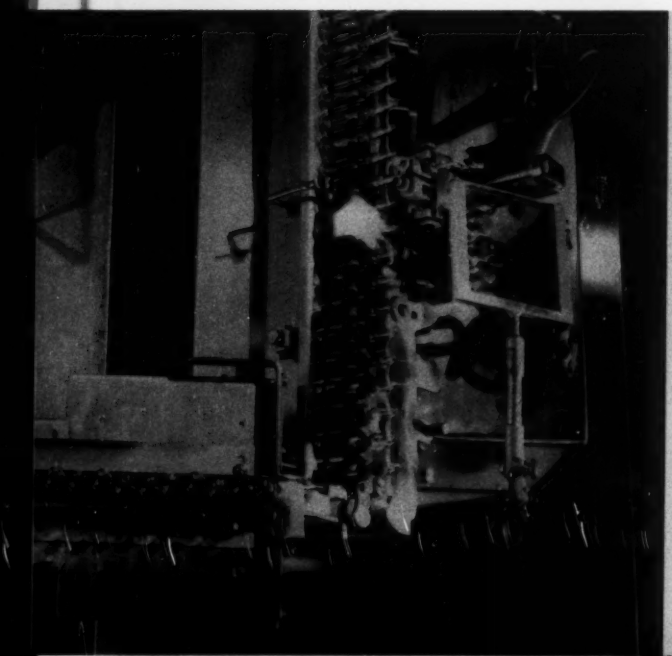
91 AAF UNITS

Supply More Than 1,000,000 c.f.m. . . . of Clean Air

MODERN pharmaceutical manufacturing creates highly diversified problems of air care. These range from maintaining sterile laboratory conditions to eliminating dust in maintenance shops. Illustrated are a few operations at the new Portage Road plant serviced by several types of AAF air filtering products. Upjohn's selection was based on their many years of experience with American Air Filter equipment.

AIR HYGIENE PROBLEMS

solved by nine types of AAF products



FILTER TYPES AND CAPACITIES

Upjohn Portage Road Plant

TYPE	NO. OF UNITS	TOTAL CAPACITIES cfm
AAF Electro-Matic	7	83,850
AAF Electro-Airmat	1	2,000
AAF Electro-PL	1	2,000
AAF Multi-Duty	53	830,570
AAF Multi-Panel	1	15,000
AAF Roto-Clone Type D	4	19,470
AAF Roto-Clone Type W	23	96,920
AAF Dust Box	1	1,200
TOTAL	91	1,051,010

AAF's Amer-glas disposable filter is used extensively throughout the plant.

● Bacterial filtration processes require exceptionally sterile conditions. Here, AAF's Electro-Matic supplies *super-clean* air by highest cleaning efficiency.

● Freeze Dry Area. Another operation requiring highly sterile conditions, as seen by visitors through observation panels. Again Electro-Matics supply the *super-clean* air required.

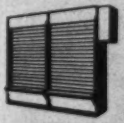
● Coating Pan battery. AAF's Type W Roto-Clone controls this dust source. These hydrostatic precipitators collect dust and store it in sludge form within self-contained units.

Upjohn's new Portage Road plant occupies approximately 33.2 acres of floor space. Main manufacturing building is 875 feet wide and 1120 feet long.

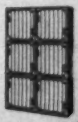
Antibiotics building at far right.

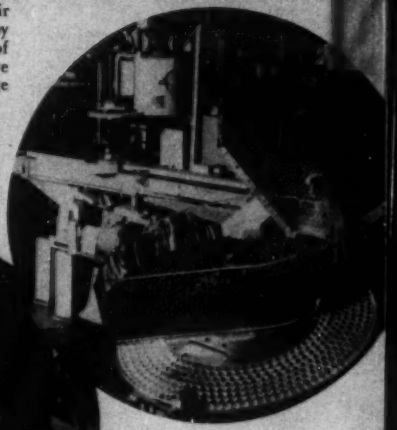
● Counting and Packaging. Air for this operation is filtered by AAF's Multi-Duty. A total of fifty-three Multi-Duty units are installed at the new Portage Road plant.

● Spray Drying. AAF's PL-24 and Amer-glas filters make an efficient team to eliminate airborne particles.



● Conveyors and transfer points. American Air Filter's Type W Roto-Clones provide complete collection of finely divided material at the source.





today's best buy is better air!

THERE IS ONLY ONE COMPLETE LINE OF AIR CLEANING EQUIPMENT...AAF!

For thirty years American Air Filter has pioneered air filtration and dust control. Today its highly diversified products serve industry and commerce throughout the world.

AAF's engineering research in the control of air pollution is continually developing new methods, new products and solutions to new problems. The engineering staff is recognized as having the outstanding experience available in this field. If *you* have a problem requiring *clean air* call your AAF representative. He will provide a practical solution.

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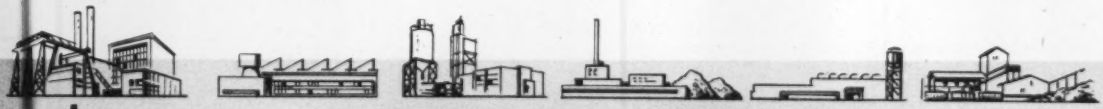
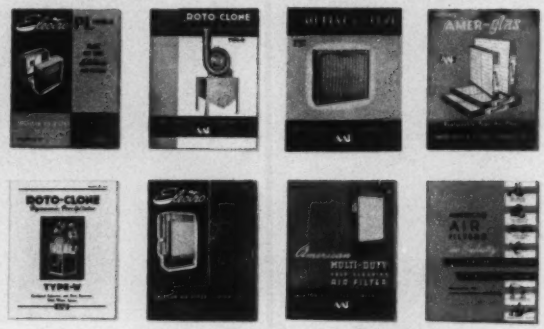


These are a few of many AAF Engineering Bulletins covering all phases of air cleaning and the complete line of AAF products. Bulletins will be mailed on written request.



AAF

American Air Filter

COMPANY, INC.

215 Central Avenue, Louisville 8, Ky. • In Canada: Darling Brothers, Ltd., Montreal, P. Q.

How good a waiter are you?

Do you burn up when the wife keeps you waiting? Do you pace the floor when the whole job waits on one valve? Then, listen.

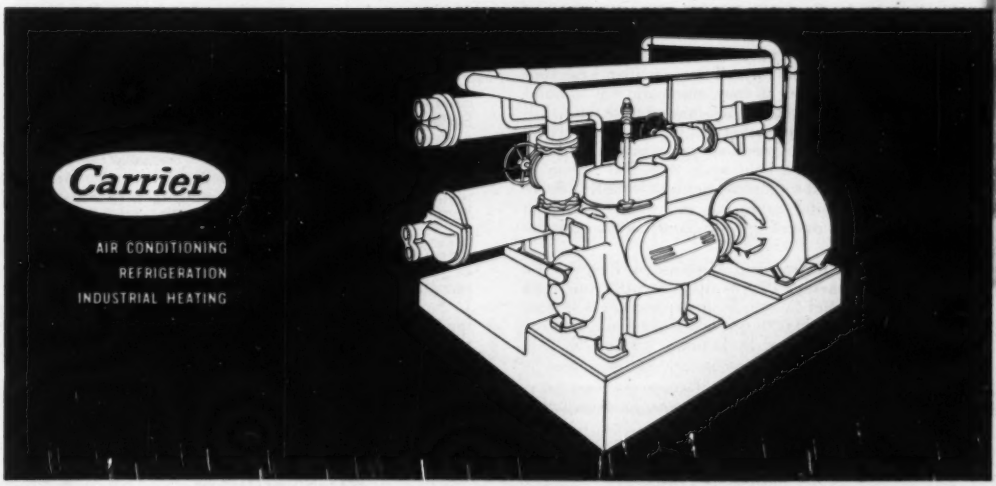
We've got a machine . . . a refrigerating machine. It's the Carrier 100 and 150 hp. Reciprocating Refrigerating Machine. And it's a complete refrigeration system for cooling water or brine . . . for air conditioning or industrial processes.

You get a compressor, a cooler, a condenser, precut piping, valves, control panel, selective fittings, cooler and condenser stands, heat exchanger, foundation drawings, and foundation bolts and sleeves.

So instead of specifying a lot of nuts and bolts, you specify "30B4" or "30B6."

And, instead of waiting for someone to send you this, and someone to send you that . . . and winding up waiting, you get everything at one time from us.

Sound good? There's more. The Carrier Reciprocating Refrigerating Machine costs less than if you assembled your own. And, oh yes, it's a lot better machine. It's factory engineered—and we stand behind it. A little booklet has the full facts. Write for it. Carrier Corporation, Syracuse 1, New York.



The Carrier Reciprocating Refrigerating Machine is adaptable to electric motor, gas or diesel engine and steam turbine drive.

"For today and for the future..."

THEODORE E. MUELLER

President, American Radiator and Standard Sanitary Company

"For today and for the future; for yourself and for your country; the Payroll Savings Plan is a thoroughly American plan. By helping ourselves through savings we maintain and extend individual independence and help our country preserve its freedom. Thousands at American-Standard are carrying forward this sound American tradition of national-help through self-help."

". . . national-help through self-help"—that's the Payroll Savings Plan!

Introduced in 1941 and offered to millions of employees by alert managements, the Payroll Savings Plan has given employed men and women an easy, automatic way to build financial independence, save for a home, educate their children and gain many benefits that can be acquired only by thrift. It has built up a tremendous reserve of purchasing power: today, Americans hold more than $58 billion in U. S. Savings Bonds. It has helped to provide cash to retire maturing Savings Bond issues and pay off $6 billion in bankheld debt. It is one of our strongest checks on inflationary tendencies.

In these critical days, when "Defense is Everybody's Job" the Payroll Savings Plan is up front with America's defenders. Month after month, in upwards of 21,000 companies, more than 8,000,000 men and women are building a bulwark of thrift dollars. In January, 1951, 3,587,000 $25 Defense Bonds and 1,028,000 $50 Defense Bonds were purchased—the majority by serious savers on the Payroll Savings Plan.

Management is doing its part—in a big way. Hundreds of companies, large and small, are reinstating the Payroll Savings Plan or vitalizing the existing plan by a person-to-person canvass that puts a Payroll Savings Application Blank in the hands of every employee. No pressure is exerted—or needed. In Mr. Mueller's American-Standard plants, for example, the person-to-person canvass added 7,800 more employees to the plan that protects.

If your company does not have a Payroll Savings Plan . . . or if you have not made a person-to-person canvass recently . . . phone, wire or write to Savings Bond Division, U. S. Treasury Department, Suite 700, Washington Building, Washington, D. C. Your State Director will be glad to help you.

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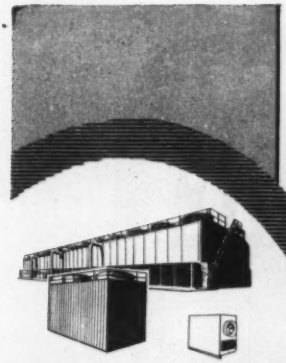

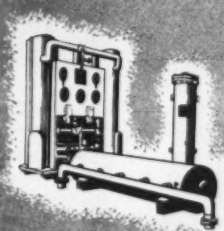

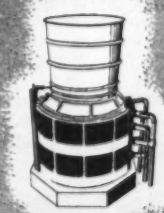

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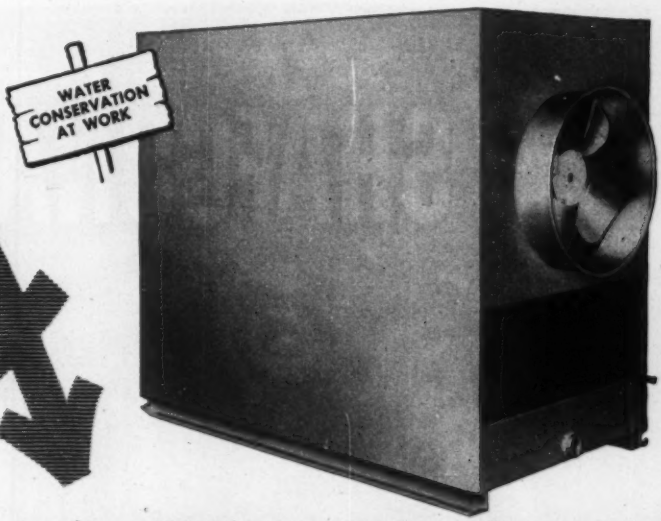


Pritchard's NEW, Better-Than-Ever Packaged COOLING TOWERS

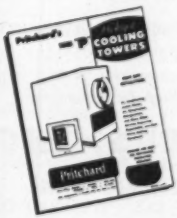
Help You Save Water

You can now put water conservation to work efficiently and economically on air conditioning and refrigeration installations with Pritchard's new Series "P" Packaged Cooling Towers. This *low cost* Induced Draft Tower is built to give up to 20 tons capacity.

Manufactured of highest quality materials, the Series "P" tower is shipped either "knocked down" or shop assembled, and is available in painted steel, stainless steel or aluminum. Easily installed.

Protect our natural resources. Prevent water wastage!

Wherever you see a Pritchard Cooling Tower, you see water conservation at work!



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FOUR ESSENTIAL FEATURES found only in SHAFCONAIRE*

SHAFCONAIRE! It's the *original* overhead oil-fired furnace known for years as SHAFCO. And it's the only furnace of its type that has been time-tested, proved-in-use over 12 long years of actual field operation. That's of prime importance to you, too. Because, regardless of a manufacturer's claims and written guarantees, time . . . and time alone . . . offers the only positive proof of the merits of any product. It's your one best assurance of quality, performance, and dependability.

So take a good look at SHAFCONAIRE OVER-HEAD HEATERS. Look under the casing . . . at the all-important inside furnace construction details. See for yourself the exclusive, essential, patented features that have made SHAFCONAIRE the leader of its field, the outstanding quality "buy" on the market today!

1 **BUILT-IN PLENUM CHAMBER**—This exclusive patented SHAFCONAIRE feature saves you plenty of time and trouble in making installations. It's engineered and sized to handle capacity of the furnace. Assures uniformly heated warm air output, improves operating efficiency, reduces installation costs. Eliminates necessity of on-the-job sizing and extra sheet metal work. Ducts may be quickly, easily tapped off from end, top, and both sides to meet installation requirements.

2 **HEAVY DUTY FURNACE**—Use of heavy gauge welded boiler plate construction assures long-life, trouble-free performance. No strains, no warping, no buckling. No burn-outs common to stamped steel fabrication.

3 **INTERMEDIATE HEAT-TRAVEL SECTION**—Patented intermediate chamber between refractory-line firebox and heavy gauge heat exchangers serves to spread flame, permit expansion of hot gases. Effectively prevents impingement of flame on metal, increases life and overall operating efficiency of the furnace.

4 **EFFICIENCY ENGINEERED HEAT EXCHANGER**—Alternately spaced baffle plates in each heat exchanger section effectively retards flow of hot gases toward stack connection, permits maximum transfer of heat through the exchanger.

OVERHEAD HEATERS, INC.

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Please send me complete information and price lists on your SHAFCONAIRE (formerly SHAFCO) OverHead Heaters.

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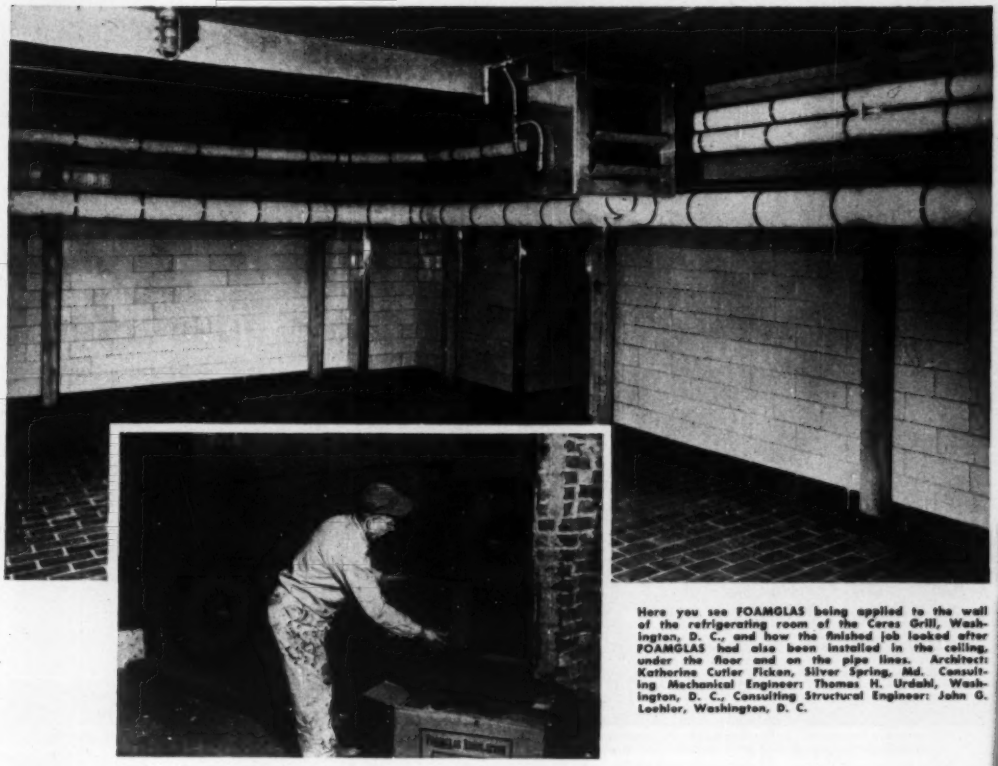
*Address*_____

*City*_____ *Zone*____ *State*_____

*SHAFCONAIRE, the original overhead furnace formerly known as SHAFCO. Designed, engineered, and built exclusively for commercial and industrial applications. Models from 100,000 to 405,000 B.T.U. Backed by over 12 years actual operation in the field. Send in coupon today for complete details and price information.



Here you see FOAMGLAS being applied to the wall of the refrigerating room of the Ceres Grill, Washington, D. C., and how the finished job looked after FOAMGLAS had also been installed in the ceiling, under the floor and on the pipe lines. Architect: Katherine Cutler Ficken, Silver Spring, Md. Consulting Mechanical Engineer: Thomas H. Urdahl, Washington, D. C., Consulting Structural Engineer: John G. Loehler, Washington, D. C.

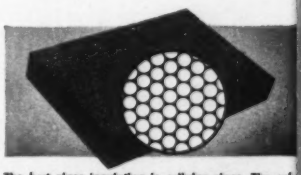
Keep Climate . . . and Costs . . . in Line

WITH FOAMGLAS . . . THE LONG LIFE INSULATION

● You can make climate control—regulation of temperature and humidity—eminently practical with FOAMGLAS, the cellular glass insulation. By *practical* we mean *effective* and *economical.*

A properly-engineered installation of FOAMGLAS, on roofs and ceilings, in walls and under floors, on hot and cold piping, helps heating and air-conditioning equipment to do a better job at lower cost. It is the essential feature of climate control.

You will find a lot of helpful information in our current literature. Just send the convenient coupon and your choice of our current booklets—with a sample of FOAMGLAS—will be forwarded promptly.



The *best* glass insulation is cellular glass. The *only* cellular glass insulation is FOAMGLAS. This unique material is composed of still air, sealed in minute glass cells. It is light weight, incombustible, vermin-proof. It has unusually high resistance to moisture, chemicals and other elements that cause insulation to deteriorate.

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FOAMGLAS® *the cellular glass insulation*

When you insulate with FOAMGLAS — the insulation lasts!

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Please send me without obligation a sample of FOAMGLAS and your FREE booklet on the use of FOAMGLAS for Normal Temperature Commercial, Industrial and Public Buildings ☐ Refrigerated Structures ☐ Piping and Equipment ☐.

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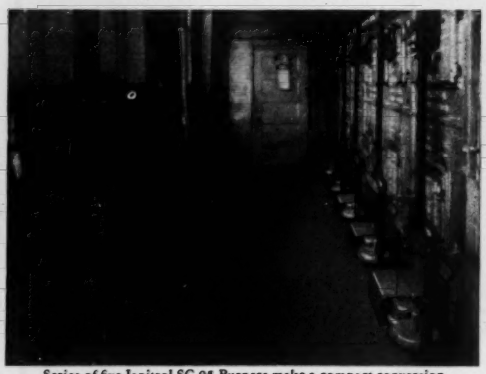
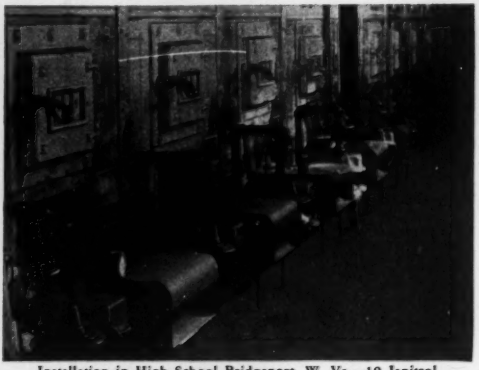
High Schools Switch to

®Janitrol GAS-HEATING Brings many advantages

High School at Paden City, W. Va. is typical of several schools recently converted to automatic Janitrol Gas Heating.



Series of five Janitrol SC-05 Burners make a compact conversion with a minimum of installation work in Paden City High School.



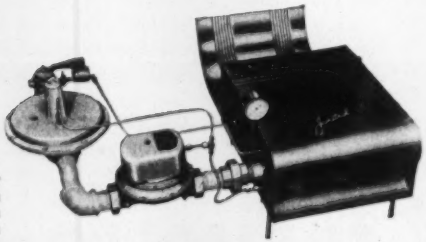
Installation in High School Bridgeport, W. Va.—10 Janitrol SC-05 burners provide an input rating up to 7½ million Btu/hr. Contractor: Joseph Iaquinta and Sons.

Unusual construction of American Warming and Heating Furnaces in Jackson School, Bellvue, Pittsburgh proves no conversion problem through use of Standard Janitrol SC-05 Burners—Installation by Weber Company.

Other management people of schools, public buildings, apartments and industrial buildings can learn a profitable "lesson" from the experience of several high schools in converting to gas heating.

Among the many advantages of gas as a fuel and Janitrol as the preferred equipment the following benefits should interest your prospects:

Lower fuel cost. More efficient use of fuel. Quick, economical installation with standard Janitrol equipment. Completely automatic operation with no fuel to store or combustion residue to haul away. Positive safety protection and proved performance. Full acceptance by Underwriters, American Gas Association and Gas Utilities.



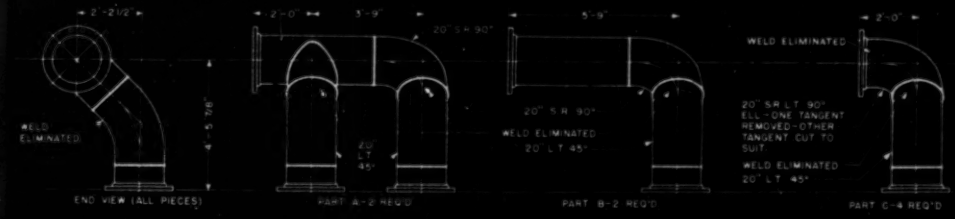
The Janitrol Model SC-05 Conversion Burner is designed for conversion installations which require input capacities from 325,000 up to 750,000 Btu per hour. Flexibility of installation for furnace or boilers with an ashpit opening not less than 15-1/8″ wide by 7-5/32″ high, and in which the depth of the burner throat does not exceed 4″ permits use in a wide variety of applicalions.

For more complete specifications and information, write for bulletin HCB, and "Spec." Sheet JS162.

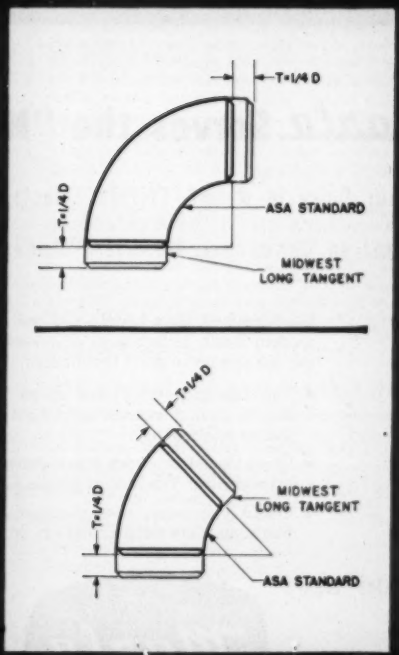
SURFACE COMBUSTION CORPORATION, TOLEDO, OHIO • ***Offices in Principal Cities.***

Janitrol Gas Heating Equipment includes Winter Air Conditioners, Gravity and Floor Furnaces, Boilers, Unit Heaters, Conversion Burners.

12% COST REDUCTION.



MIDWEST



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Improve Piping Designs
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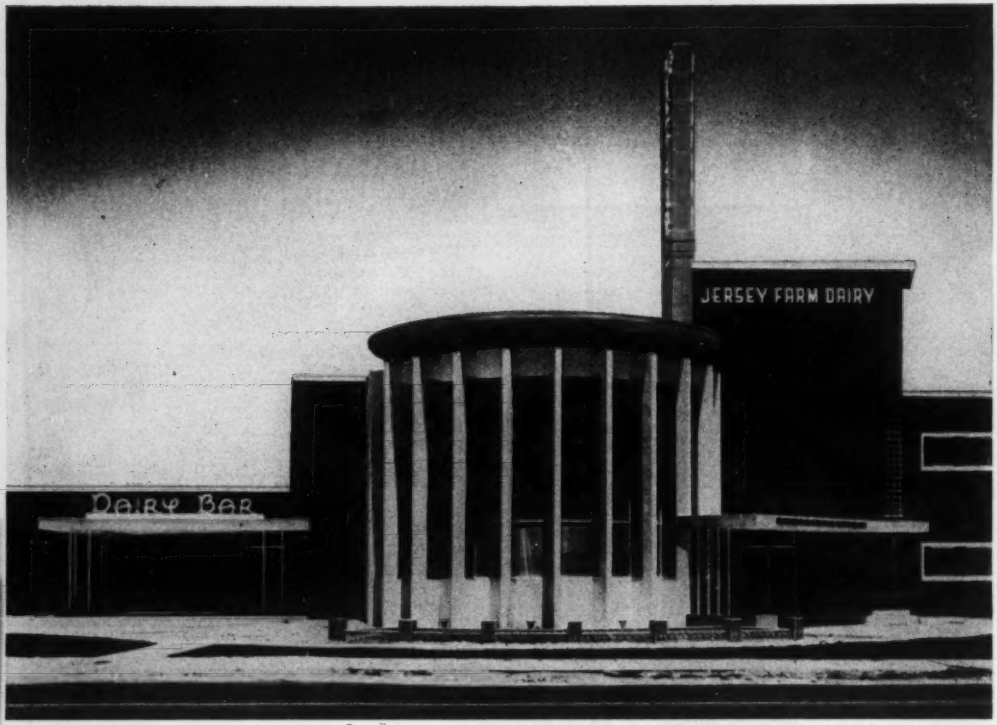
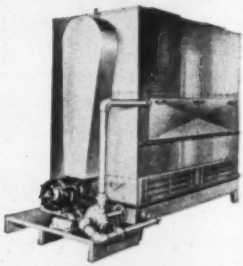


Architect: Robert Fitch Smith & Associates, Consulting engineer: Maurice H. Connell & Associates, Inc., Refrigeration contractor, Dade Refrigerating Co., Inc., all of Miami.

Marlo Serves the "Nation's Largest Dairy"*

McArthur Dairy in Miami, Florida selects Marlo Evaporative Condenser for Ultra Modern Plant



Marlo Evaporative Condenser

Engineered to serve better—and last longer—modern Marlo cooling units offer these important advantages to *every* installation:

- Top Efficiency—they save up to 95% of normal cooling water demand through effective recycle cooling.
- Quiet Operation—with mastic-coated interiors and silent V-belt drive motors.
- Out-of-Sight Installation—Compact, all-metal Marlo units are installed indoors or on roofs below the parapet, never mar building beauty.
- Durable—with exclusive four-way protection against corrosion—inside and outside.

Write for information on the modern Marlo line.

*●MIAMI *NEWS

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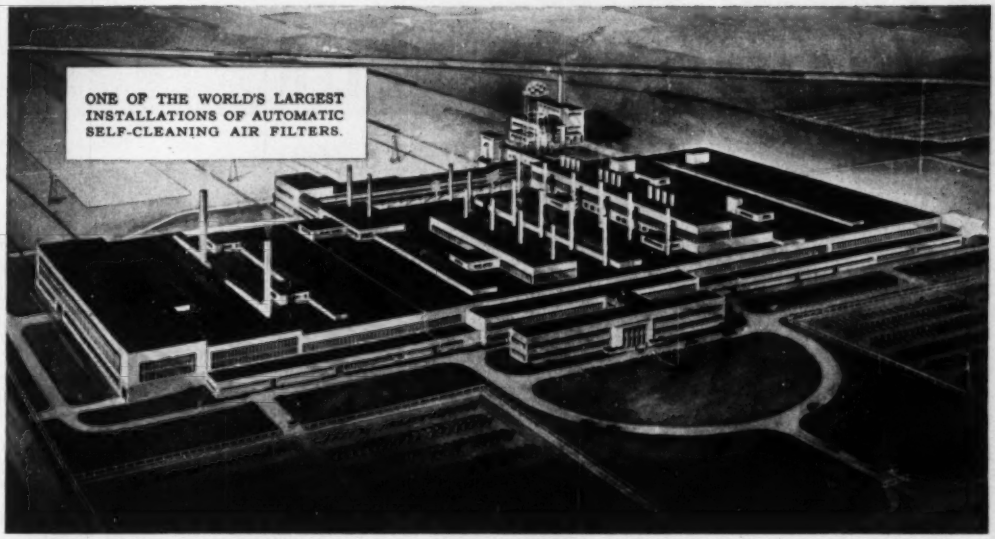
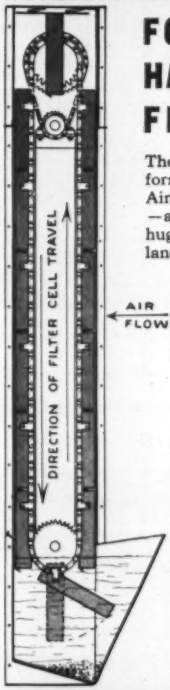


F. A. FAIRBROTHER & GEO. H. MIEHLS, Architect and Engineer ALBERT KAHN ASSOCIATES, Consultants SMITH & OBY, Contractors

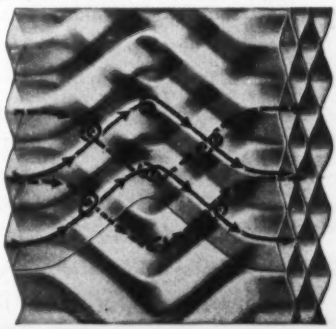
FORD MOTOR COMPANY'S CLEVELAND FOUNDRY HAS SEVERAL MILLION CFM OF CLEAN AIR AVAILABLE FROM CONTINENTAL AUTOMATIC AIR FILTERS

The Ford Motor Company—pleased with the performance of Continental Automatic Self-Cleaning Air Filters on several of their smaller installations—approved the use of these air filters for its new, huge Ford Foundry at Brook Park Village (Cleveland, Ohio).



Left: Cutaway view of filter unit (listed by Underwriters' Laboratories, Inc.) showing filter cell Ferris Wheel rotating action and self-cleaning oil bath action.

Below: Cross-section diagram of patented Filter Media showing turbulent air flow, which results in extremely high air-cleaning efficiency (91.3% by A. S. H. V. E. method), and exceptionally low resistance.



The economical solution to *your* air cleaning problems may be found more readily in the revolutionary Continental Air Filters. Here the *patented filter media* extracts air-borne dust more efficiently with constant low resistance to air flow. Filter cells pivot like cars on a ferris wheel as they pass from the front to the back filter curtain. There is no reversal in the direction of air flow through the filter media. As a result, dirt cannot be blown off into the clean-air stream. And, filter cells are kept clean with . . .

UNIQUE AUTOMATIC SELF-CLEANING ACTION

For 30 minutes or more each filter cell soaks in the oil reservoir in a semi-horizontal position. Then the cell drops to a vertical position . . . thus causing the resultant surge of oil to pass through and effectively flush clean each air passage. The entire air filter operation provides minimum air resistance and maximum air cleaning efficiency.

WRITE TODAY FOR PERFORMANCE DETAILS

Before you specify or buy, ask us for complete performance data on Continental Automatic Self-Cleaning Air Filters. Use the coupon. No obligation.

GENTLEMEN: Please send the following:

☐ Bulletin No. 201-C

☐ Sample of Eswash Air Filter Media

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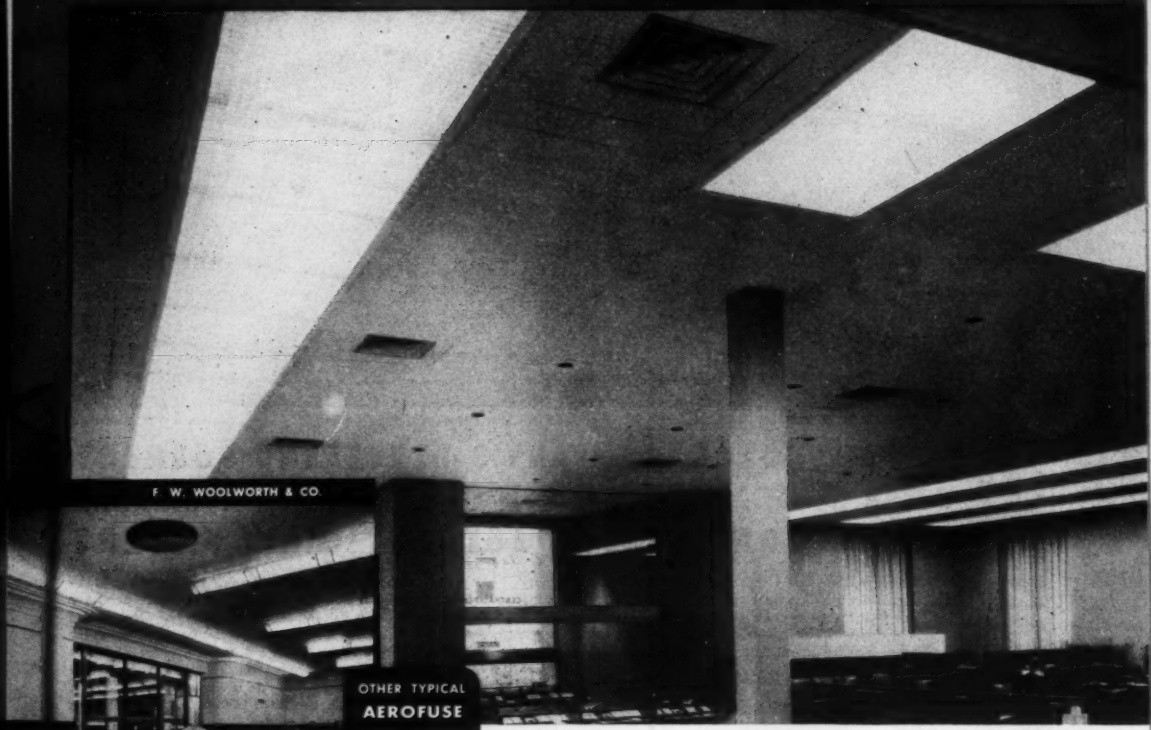

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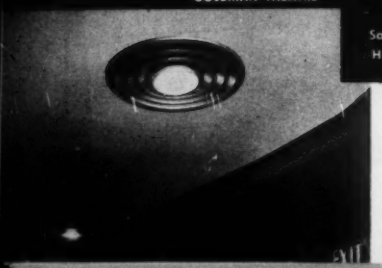
F. W. WOOLWORTH & CO.

GIMBEL BROTHERS

GOLDMAN THEATRE



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Whether you shop, work or relax in air conditioned comfort in the Quaker City, there's a good chance that Aerofuse Diffusers are there, too. For, as in other cities the country over, important air conditioning jobs in historic Philadelphia are Aerofuse jobs. In department stores, theatres, banks, offices, etc.—where conditions and requirements vary widely—the men responsible for these installations know from experience that when they select diffusers from the Aerofuse line they will meet the most rigid specifications of performance and appearance . . . *at the vital point of air delivery.*

Send for your copy of Aerofuse Catalog 104 . . . complete information, size selection data, engineering details.

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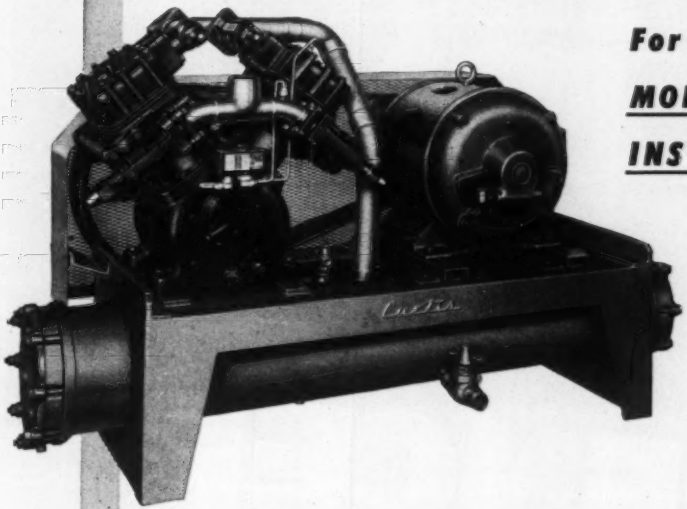
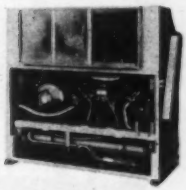
NOW A 40 H. P. CURTIS

WATER-COOLED CONDENSING UNIT



For LARGER, MORE PROFITABLE INSTALLATIONS

Packaged Type,
2, 4, 6, 8 Tons



Central Type,
10, 15 Tons

Some of the advanced design features that have made Curtis units so popular with the trade and the user in these larger models are:

- TIMKEN BEARINGS — LESS FRICTION — Easier adjustment.
- PRESSURE LUBRICATION — With low-pressure safety cut-out.
- SLOW-OPERATING SPEED — Economical — More capacity — Long Life.
- UNLOADED STARTING — 3-step capacity reduction

Complete range of condensers for any requirement.

With the broad Curtis line, you can handle all of the more profitable air conditioning and refrigeration installations. A limited number of franchises are open.

Curtis REFRIGERATION AIR CONDITIONING COMMERCIAL

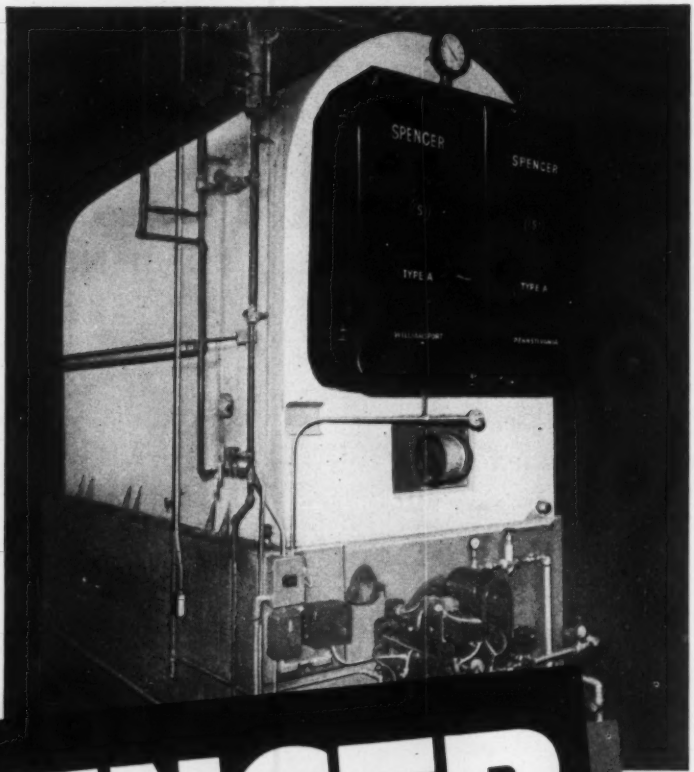
Curtis *97 Years of Successful Manufacturing*

Pin this to your letterhead and mail R-51-3

CURTIS REFRIGERATING MACHINE DIVISION
of Curtis Manufacturing Company
1950 Kienlen Ave., St. Louis 20, Mo.

I am interested in Curtis line. Please send me complete information.

The modern new Father Mantignon High School in Cambridge, Massachusetts relies on Spencer Boilers like this for dependable heat and hot water.



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THE QUALITY LINE OF HEATING BOILERS

THERE IS A SPENCER FOR EVERY BUILDING, FOR EVERY FUEL

Both cast iron and steel . . . a selection of 76 models . . . versatile, dependable, backed by more than sixty years of leadership . . . precision engineered and manufactured to give superior, *guaranteed* service.

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Get them all with these pumps

PEERLESS PUMPS

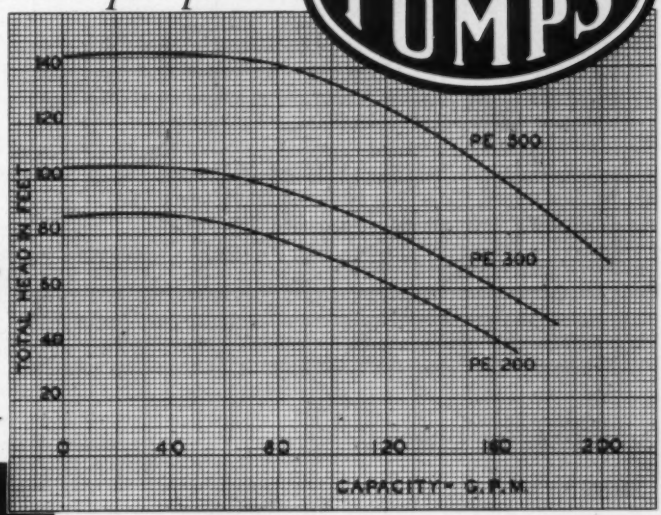
in the **PEERLESS** *Fluidyne* **LINE**

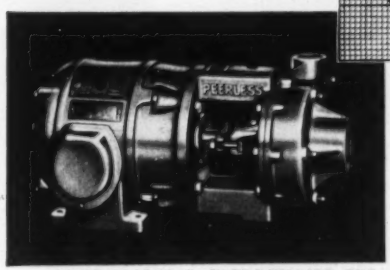
FOR INTEGRAL HP GENERAL PURPOSE PUMP USERS...

HERE ARE THE RATINGS

HERE'S THE PUMP

PEERLESS *FLUIDYNE* TYPE PE PUMP 2 TO 5 HP





KEY TO CHART Performance chart showing head capacity characteristics of Peerless Type PE integral hp Fluidyne pumps at 3450 rpm

KEY TO PUMP HP

PE 200—2 hp
PE 300—3 hp
PE 500—5 hp

ILLUSTRATING THE PEAK PERFORMANCE YOU GET WITH PEERLESS FLUIDYNE PUMPS

The performance chart above clearly points the way to economical pump selection for users of 2, 3, and 5 hp end-suction, general purpose pumps. Same high efficiencies characterize fractional models from ¼ hp on up. Get Peerless efficiency, Peerless economy, Peerless compactness and Peerless ease of maintenance by buying from the Fluidyne line, the pump with all the quality features you want in a general purpose pump.

WRITE FOR NEW BULLETIN that completely describes the features of both fractional and integral hp pumps in the Peerless Fluidyne line. Contains 24 pages of application and engineering data. Mail the coupon today.

SAME FEATURES CHARACTERIZE THE COMPLETE PEERLESS FLUIDYNE LINE—FROM ¼ TO 150 HP

Peerless makes available one of the broadest lines of general service, end-suction pumps offered by any pump manufacturer. Both bracket mounted (Type PE) and close-coupled (Type PB) models are available. Overall capacity range: up to 5500 gpm. HP range: bracket mounted, from ¼ to 40 hp; close coupled from ¼ to 150 hp. One of these Peerless Fluidyne pumps in this line is sure to meet and match all the requirements of your application.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Address inquiries to Factories at:
Los Angeles 31, California and Indianapolis 8, Indiana
Offices: New York, Chicago, St. Louis, Atlanta, Dallas, Plainview and Lubbock, Texas; Fresno, Los Angeles; Phoenix; Albuquerque, New Mexico.

PEERLESS PUMPS fmc

Peerless Pump Division
Food Machinery and Chemical Corporation
301 West Avenue 26, Los Angeles 31, Calif.

Please send me without obligation new Bulletin B-2300 describing Fluidyne line of fractional and integral hp pumps.

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CITY _____ STATE _____

HPAL

JENKINS PRACTICAL PIPING LAYOUTS 56

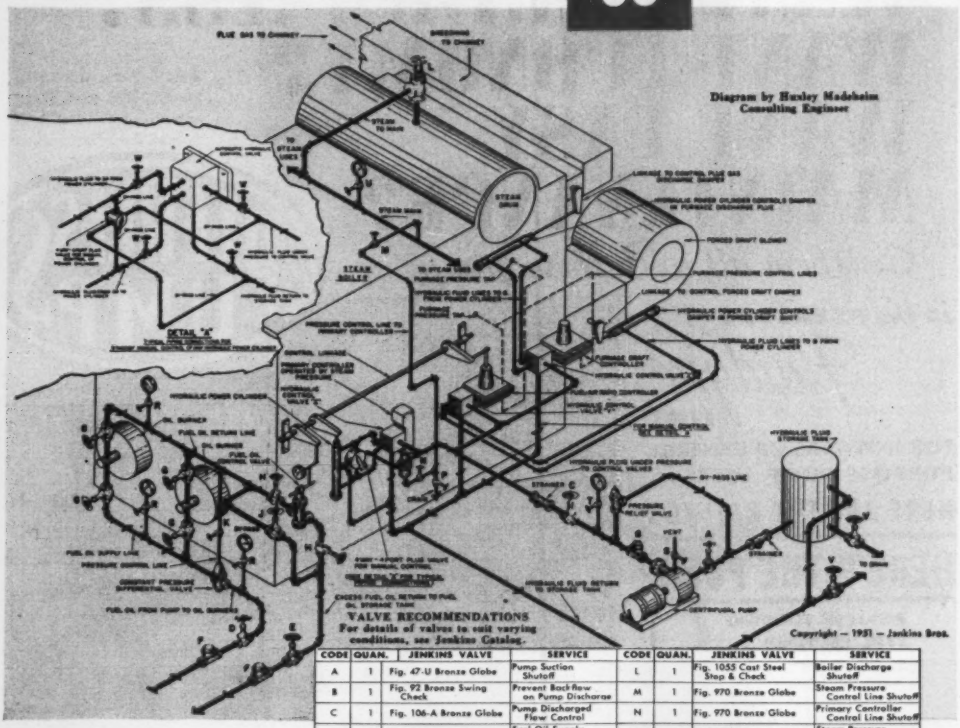
Diagram by Huxley Madeheim
Consulting Engineer
VALVE RECOMMENDATIONS
For details of valves to suit varying conditions, see Jenkins Catalog.
Copyright — 1951 — Jenkins Bros.

CODE	QUAN.	JENKINS VALVE	SERVICE	CODE	QUAN.	JENKINS VALVE	SERVICE
A	1	Fig. 47-U Bronze Globe	Pump Suction Shutoff	L	1	Fig. 1055 Cast Steel Stop & Check	Boiler Discharge Shutoff
B	1	Fig. 92 Bronze Swing Check	Prevent Back-flow on Pump Discharge	M	1	Fig. 970 Bronze Globe	Steam Pressure Control Line Shutoff
C	1	Fig. 106-A Bronze Globe	Pump Discharged Flow Control	N	1	Fig. 970 Bronze Globe	Primary Controller Control Line Shutoff
D	1	Fig. 930 Bronze Globe	Fuel Oil Supply Shutoff	P	1	Fig. 976-A Bronze Globe	Steam Pressure Control Line Drain
E	1	Fig. 930 Bronze Globe	Fuel Oil Return Shutoff	R	3	Fig. 741-G Bronze Needle	Fuel Oil Pressure Gage Control
F	2	Fig. 762 Bronze Swing Check	Prevent Fuel Oil Back-flow	S	1	Fig. 106-A Bronze Globe	Pump Vent Valve
G	4	Fig. 930 Bronze Globe	Burner Shutoffs	T	1	Fig. 741-G Bronze Needle	Pressure Gage Control
H	2	Fig. 270-U Bronze Globe	Fuel Oil Control Valve Shutoff	U	1	Fig. 703 Bronze Needle	Pressure Gage Control
J	1	Fig. 936 Bronze Globe	Manual Fuel Oil Control	V	2	Fig. 106-A Bronze Globe	Hydraulic Fluid Drains
K	1	Fig. 741-G Bronze Needle	Fuel Oil Pressure Control Line	W	4	Fig. 47-U Bronze Gate	Automatic Control Shutoff

How to plan AUTOMATIC COMBUSTION CONTROLS

The system shown is the hydraulic control type for a forced draft oil-burning boiler. Small changes in steam line pressure, resulting from fluctuations in steam demand, are transmitted to a primary controller. They actuate hydraulic control valve X, which in turn controls the flow of hydraulic fluid to a hydraulic cylinder.

Furnace pressure from two tapped points in the flue-gas flow stream is transmitted to the fuel-air ratio controller which actuates hydraulic control valve Y. This valve positions a damper in the furnace air supply duct, regulating the flow of air into the furnace to maintain a correct fuel-air ratio.

A draft controller, operated by furnace pressure, is installed to maintain balanced furnace pressure. This balance is effected by hydraulic control valve Z and the power cylinder which operates the flue gas damper.

Manual control of any or all three power cylinders can be accomplished by the installation of a four-way port lubricated plug valve hookup (as shown in insert).

Consultation with accredited piping engineers and contractors is recommended when planning any major piping installations.

JENKINS VALVES
LOOK FOR THE DIAMOND MARK
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A CHOICE OF OVER 500 VALVES

To save time, to simplify planning, to get all the advantages of Jenkins specialized valve engineering, select all the valves you need from the Jenkins Catalog. It's your best assurance of lowest cost in the long run. Jenkins Bros., 100 Park Ave., New York 17; Jenkins Bros., Ltd., Montreal.

COMPLETE DESCRIPTION AND ENLARGED DIAGRAM OF THIS LAYOUT FREE ON REQUEST. Includes additional detailed information. Ask for Piping Layout No. 56.

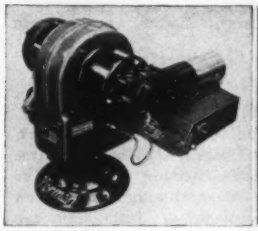
EQUIPMENT DEVELOPMENTS...

For your convenience in obtaining more information about any of this equipment, see coupon on this page. Add the new products and companies listed here to your Directory Section which you received in your January 1951 Heating, Piping & Air Conditioning and thus keep your records of sources of supply up to date throughout the year. Single asterisk indicates equipment not listed in Directory Section; double asterisk, equipment and manufacturer not listed.

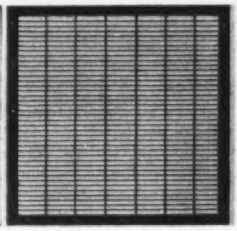
Gas-Oil Burner

HPAC 1—The new "Twinfuel" combination gas-oil burner for industrial and commercial applications has been developed by Norman Products Co., Columbus, O. The burner, which switches automatically from gas to oil, is regulated by an outside thermostat set at the temperature point at which service difficulties might be expected. There is also an automatic change corresponding to drops or rises in the pressure of gas lines.

In industrial production heating operations, it can be used for the initial startup of each firing period. When proper stack temperature is reached the gas valve automatically opens, putting positive gas pressure in the gas manifold and breaking the oil burner circuit as soon as gas pressure is established. The burner is available in seven sizes, ranging in capacity from 80,000 to 3,000,000 Btu.



Burner



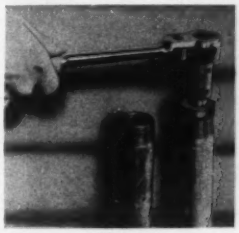
Grille

Industrial Air Conditioning Grille

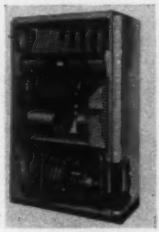
HPAC 2—A new heavy duty industrial air conditioning grille is now available from Titus Mfg. Corp., Waterloo, Ia. The grille face has 14-gage steel blades set on 3/8 in. centers. In addition, 14-gage steel vertical support bars are placed on 6 in. centers, and 16-gage steel is used in the border. The company's solid section "Airfoil" louvers are used for volume control, and blades are individually adjustable. Grilles come with a standard grade primer coat finish, though they may be custom finished.

Internal Pipe Wrench

HPAC 3**—A new internal pipe wrench, in five sizes ranging from 1/4 to 1 in., is being manufactured by Clark Bros. Mfg. Co., Hillsboro, Ore. The wrench, which grips the pipe on the inside, can be used in installing or removing short nipples without damage to threads; for removal of broken pipe from couplings, bushings, etc.; and in work against bulkheads, walls or in other crowded places. The smaller sizes also may be used as an easy out for broken studs. If the wrench is placed in a vise, short nipples may be made on the job. Wrenches operate with a 1/2 in. drive ratchet handle, a 1/2 in. flex handle, open end wrenches and other types if necessary.



Wrench



Conditioner

Air Conditioner

HPAC 4—The largest of the self-contained air conditioners produced by Westinghouse Electric Corp., Sturtevant Div., 200 Readville St., Boston, is now the "SU-81" 8-ton unit which can be used in factories, offices and commercial buildings. It cools, dehumidifies, circulates and filters the air, and winter conditioning can be provided by addition of steam or hot water heating coils and an outside air duct. The unit contains a "Freon-12" compressor, water-cooled condenser, direct expansion coil and centrifugal fan. It is rated at 96,000 Btu per hr with a 7 1/2 hp compressor. It can operate on a single-, two-, or three-phase, 50 or 60 cycle current. Voltage ratings range from 230 on a single-phase to 550 on a three-phase current.

FOR YOUR CONVENIENCE [8-51]

Heating, Piping & Air Conditioning
6 N. Michigan Ave., Chicago 2, Ill.

Please ask the manufacturers to send me more information about the equipment mentioned under the following reference numbers in Equipment Developments and Recent Trade Literature

(Circle each HPAC number in which you are interested)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26				
101	102	103	104	105	106	107	108	109	110
111		113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130

Name ..... Title .....

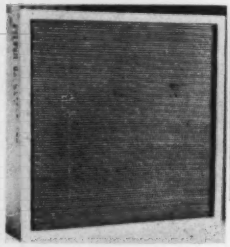
Company .....

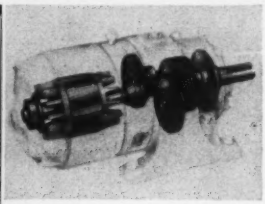
Address .....

City ..... Zone ..... State .....

Air Filter

HPAC 5**—An absolute air filter designed to remove more than 99.98 percent of all dust, smoke, fumes, radioactive particles, spores and other microscopic matter as small as 2 to 3 microns in diameter is now available from Cambridge Corp., 350 S. Geddes St., Syracuse, N.Y. The filter is composed of a soft paper, containing asbestos fibers, which is folded and packed into the filter in an accordion pleat arrangement. Dimensions of the filters are 24 x 24 x 5 7/8 in. deep for the 500 cfm size and 11½ in. deep for the 850 cfm size. Individual units may be arranged in multiple banks. The manufacturer states that the filter will be especially useful in the manufacture of photographic film, chemicals, electronic tubes and optical and other precision instruments; in pharmaceutical plants, laboratories and hospitals; and in applications involving radioactive materials or toxic fumes.





Above: Motor
Left: Filter

Twin Pinion Geared Motor

HPAC 6—The new type GL "Syncrogear" motor developed by U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, utilizes two secondary pinions to drive the output gear, doubling the effective torque rating of a single pinion and gear unit. A splined herringbone pinion is incorporated to divide the load equally between the two secondary pinions. Available in a range of from 5 to 25 hp and in speeds of from 30 to 84 rpm, the motor has asbestos-protected windings, normalized castings and solid centricast rotors.

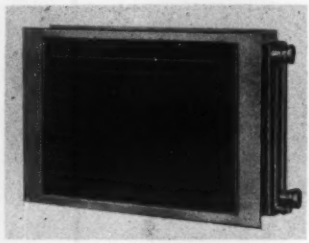
Ceiling for Radiant Heating, Cooling

HPAC 7**—A new type of ceiling affording radiant heating and cooling, as well as acoustic control, is being produced by Burgess-Manning Co., Architectural Products Div., 5970 Northwest Highway, Chicago. This new prefabricated development can be used for remodeling or new construction in offices, institutions, public buildings, etc. The ceiling consists of perforated metal panels which are heated by hot water. The ceiling area is heated uniformly and creates uniform warmth throughout the room, the manufacturer states. Blankets of acoustical material above the heating units act as a thermal insulator and vapor barrier. High temperatures and a fast warmup period are possible and an ordinary thermostat usually is sufficient as the control. The ceiling also provides summer air conditioning with cold water circulating through the system and absorbing heat from the room.

Heating Coil with Defroster

HPAC 8—Rempe Co., 340 N. Sacramento Blvd., Chicago 12, is offering a new line of steam heating coils, in single and double row design, for use in combination with air conditioning coils or as tempering and booster units in long heating ducts. Capacities range from 60,000 to 775,000 Btu per hr. The coils are tested to 350 lb air pressure for steam working pressures up to 125 lb, the manufacturer states.

A special feature of these coils is the defroster, which prevents freeze—up when they operate with air below 30 F.



Heating Coil

Pump

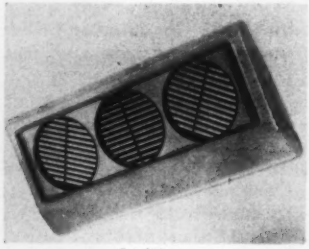
Vertical Sump Pumps

HPAC 9—The four basic models in the new line of vertical sump pumps offered by The Deming Co., Salem, Ohio, are made in discharge sizes of from 1 to 10 in., and with capacities of from 10 to 3000 gpm and heads up to 140 ft. They are equipped with standard fluid ends but can be furnished with ends for handling sewage in the 2, 3 and 4 in. discharge sizes. The pumps are furnished with ½ to 75 hp electric motors, or for steam turbine drive.

Air Vent

HPAC 10—Maid-O'-Mist, Inc., 3217 N. Pulaski Rd., Chicago 41, is offering an improved air vent of the expansion type, no. 72, for baseboard, convector and free standing radiation in hot water heating systems. The new tamperproof cap can be removed with a large screw driver when the valve needs cleaning. Installation can be either vertical or horizontal.

Vent



Conditioner

Window Air Conditioner

HPAC 11*—Five plastic parts fit together to form the front of the new 26 in. long, 12 in. wide window air conditioning unit developed by General Electric Co., Bloomfield, N. J. Three disks with louvers set at a 45 deg angle, and held in place by spring clips, are mounted in the front panel. These can be finger-tip adjusted to distribute cooling air in any desired direction.

[*Continued on Page* 163]

Controlled Ventilation... at Hales Bar Dam

Photo courtesy Tennessee Valley Authority

It used to be mighty uncomfortable in the generator room of the hydro plant at Hales Bar, on the Tennessee River. In this old plant, purchased by TVA, hot weather temperatures often soared above 120°, and the 14 air-cooled generators could not operate at full capacity. To beat the heat, TVA engineers installed 32 DeBothezat 36" Power-Flow Roof Ventilators which pull in a total of 400,000 cubic feet of cool air every minute. Result? Greatly improved working conditions for the men, and increased power output from the generators.

LOW, STREAMLINED DESIGN

DeBothezat Power-Flow Roof Ventilator is a motor-driven fan in a weatherproof housing, for use with or without duct systems. Power-Flow Roof Ventilators can be used either for air exhaust or intake and are available with fan wheels 12" through 48" in diameter, delivering up to 40,900 CFM. For catalog containing illustrations, specifications and certified capacity ratings, write our factory, Dept. HP-750, or phone your local DeBothezat agent.

LIGHT-PROOF AT NIGHT
to comply with possible blackout regulations

Certified Ratings

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Power-Flow

ROOF VENTILATORS

Built by

DE BOTHEZAT FANS DIVISION
AMERICAN MACHINE AND METALS, INC.

THESE FIVE SIMPLE STEPS

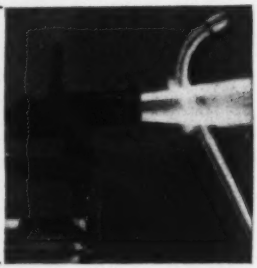
make a solder-joint!

Properly soldered connections between Chase Solder-Joint Fittings and Chase Copper Water Tube are exceptionally strong and pressure-tight. Assemblies of ½" Chase Copper Water Tube and Solder-Joint fittings have withstood over 3,400 pounds pull, and 5,000 pounds water pressure per square inch. Jobs last longer, and look better, with Chase Copper Water Tube and Solder-Joint Fittings.

1 Polish the outside of the tube and inside of the fitting with No. 00 steel wool or fine grade sand cloth.

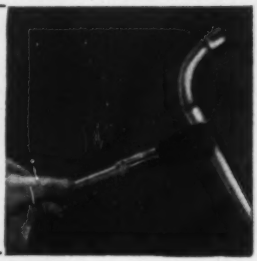
2 Apply thin coat of flux to tube and inside of fitting. Place fitting on tube and remove excess flux.

3 Heat joint evenly with a blow-torch. Remove flame and apply solder to joint. Solder will melt from wire at correct temperature.



4 Capillary attraction draws solder into joint. When solder shows around edge of fitting, connection is completed.

5 Remove excess solder with a brush. Do not place any strain on the joint until it has cooled.



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the floor register everyone wants!

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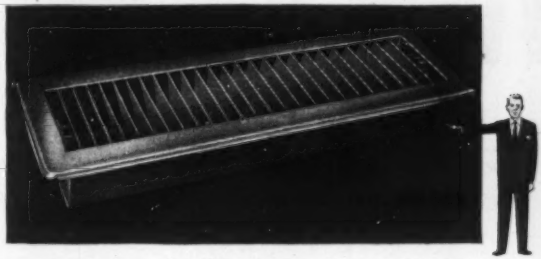
Dialamatic Control

Standard's new, exclusive dialamatic control gives you POSITIVE HEAT CONTROL. The set screw arrangement means easy balancing, trouble-free operation!



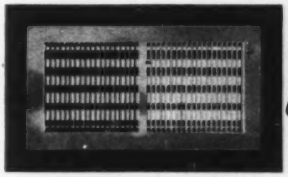
SPECIFICATIONS

The blades of model PH-142 are fabricated of 16 gauge steel, the blades are set in a fixed-fan angle degree for even deflection. The Frame is of one piece, 18 gauge steel construction. The Louvre box fabricated of 16 gauge steel. Packed one to a box, and 20 to a master carton. Comes handsomely finished in gleaming, durable metallic-lustre finish.

Duct opening	Overall of Louvre Box	Overall of Face	Open Area	Depth of Box
2¼" x 14"	2⅛" x 13¾"	3¼" x 15¾"	80%	2⅛"

THE NEW, IMPROVED *multiple valve* REGISTER

Has Horizontal Multiple Valve Louvres, and $\frac{3}{16}$" turned down edge for flush sidewall installation. The attached sponge rubber gaskets are an *extra* feature that prevents escape of air and chipping of wall surface. The Louvres are adjustable so that the flow of air may be directed either downward, straight forward, upward, or to complete shut-off.



MODEL NO. 331

Metallic Finish standard finish on this style

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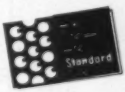
No cost or obligation to you



Standard Stamping and Perforating Co.

3137 West 49th Place—Chicago 32, Illinois

Gentlemen: Please send me your new pocket catalogue at no cost to me.

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*HP

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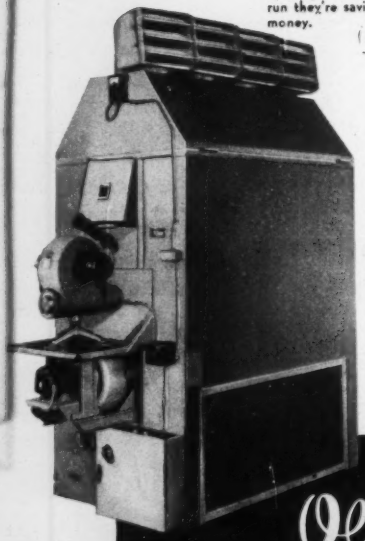
MAKE YOUR OWN COMPARISON . . . CHECK THESE FEATURES, PROVE THE SUPERIORITY OF AN OLSON HEATER

Top heating engineers all over the world are specifying Olson heaters for the biggest names in industry (names on request.) This is sound building for the future. In the long run they're saving time, trouble, and money.



Olson

ARTHUR A. OLSON & CO.
Gas, Oil, Coal or Dual Gas and Oil
BROAD ST. · CANFIELD, OHIO

Write for bulletin and engineering data sheet showing horizontal and inverted models plus other installation data.

MORE HEATING SURFACE FOR LONGER LIFE

Standard 10 gauge, 4" boiler tubes give more effective heat transfer surface.

SEPARATE DRAFT FAN

Eliminates cold blast at every start. Especially appreciated by employees.

EASY ACCESSIBILITY FOR LOW COST SERVICE

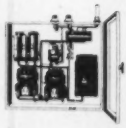
All accessories mounted on outside. Can be serviced without dismantling.

ALL POPULAR PARTS— EASILY AVAILABLE ANYWHERE, ANYTIME

All standard products of nationally known manufacturers.

RIGID CONSTRUCTION FREE FROM VIBRATION

Low fan speed, heavy-duty shaft, large, self-aligning ball bearings.



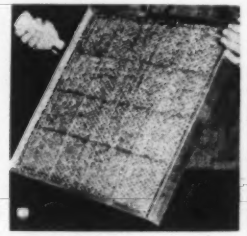
DUST-TIGHT, DAMP-PROOF CONTROL BOX

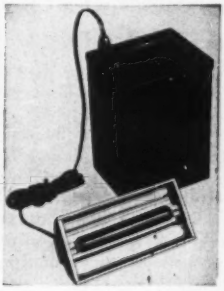
Within sight and reach of all burner adjustments. Control circuit 110 vlt.

[*Continued from Page* 158]

Deodorizing Air Filter

HPAC 12—A new filter developed by Research Products Corp., 1015 E. Washington Ave., Madison, Wis., is designed to remove odors as well as dust from areas served by heating or cooling systems. The filter is available in two types — the throwaway type, which has porous fibers impregnated with an odor removing liquid solution, and the permanent aluminum filter, which is sprayed with the liquid (as shown in photo). In the throwaway filter, the substance is effective as long as the filter catches dust, usually a three to six month period. For continued use, the permanent filter is flushed out with water and sprayed with fresh solution.





Above: Filter

Right: Detector

Leak Detector

HPAC 13**—A recently developed blacklight exploring lamp which utilizes a fluorescing agent for detecting leaks of liquids in vessels of all kinds is now available from George W. Gates & Co., Inc., Hempstead Turnpike & Lucille Ave., Franklin Sq., L.I., N.Y. A dilute solution of the fluorescing agent is placed inside the container or vessel to be tested. A slight flow through the wall is signalled by a bright glow under the influence of the rays from the exploring lamp. The unit weighs 11 lb and can be battery operated.

Forced Draft Fan

HPAC 14—The Prat-Daniel Corp., East Port Chester, Conn., has developed an improved forced draft fan with three new features — large, deep inlet cones designed to reduce turbulence at the inlet; open space between the wheels of double wheel models (instead of a common center disc) which permits four way diffusion of the air leaving the wheels; and an oversize housing to assist diffusion. Inquiries should be directed to The Thermix Corp., Greenwich, Conn.

Power Roof Exhauster

HPAC 15—The new "Gyra-Flo" power roof exhauster of Chicago Blower Corp., 4558 W. Congress St., Chicago 24, is designed for applications where operating noise must be minimized — as in schools, hospitals, etc. Air cutoff guide vanes shear the air off the revolving wheel and force it out into the atmosphere. These vanes are stationed at cutoff points simulating the scroll design of a centrifugal fan housing. The discharge cone is designed to permit the air forced off the peripheral edge of the wheel to enter the outside air with a minimum of turbu-

For day in, day out
DEPENDABILITY
you can't beat a
GOVERNAIR
COMPLETELY PACKAGED
AIR CONDITIONER

PAT. NO. 2,297,928

Name your job . . . any air conditioning job requiring from 3 to 50 tons . . . and you'll find that you can't beat a Governair system for day in, day out dependability.

Governair Packaged Air Conditioners are designed to operate at peak efficiency—with all parts precision-matched to work together. And they're built to give years and years of low-cost, trouble-free service.

Choose Governair . . . and you choose the best!

AIR CONDITIONERS | EVAPORATIVE CONDENSERS | COOLING TOWERS | UNIT COOLERS | BLAST COILS FOR HEATING AND COOLING

GOVERNAIR

Handy work bench is a Bonus!

with

RIDGID

TRISTAND

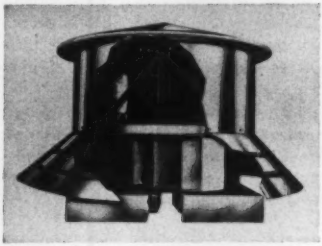
Pipe Vises

• It's right there when you need it—the handy workbench built into every Tristand. New tray keeps tools at your finger-tips—less stooping, easier work. Tray makes Tristand rigid—won't fold up in use. Legs have rubber feet to prevent travel. Lon-Grip tool-steel jaws won't slip, won't mar polished pipe and tubing. Yoke vise, 2½" capacity; chain vise, 4". Buy these new work-saver RIDGID Tristands at your Supply House.

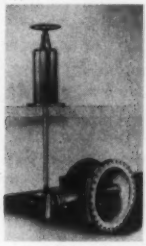
RIDGID

★ Work-Saver Pipe Tools ★

lence, the manufacturer states. The exhausters are available in belt or direct drive. Air capacities range from 830 to 29,750 cfm; static pressures, from ⅛ to ¾ in; and noise level decibels, from 61 to 88.



Exhauster



Valve

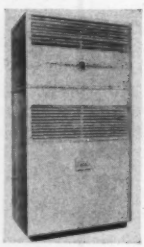
Manual Control Valve

HPAC 16—A new heavy duty valve, no. 788, of R-S Products Corp., 4600 Germantown Ave., Philadelphia 44, is equipped with totally enclosed gear reduction drive, extended shaft and floor stand. For sealing water pressure, the valve utilizes a babbitted seat in the body and monel or stainless steel welded to the periphery of the valve disc. With a 350 ft head of ambient water, a 36 in. valve with a babbitted seat is said by the manufacturer to have a leakage of not more than 50 gph. Remote, automatic or semi-automatic controls also are available.

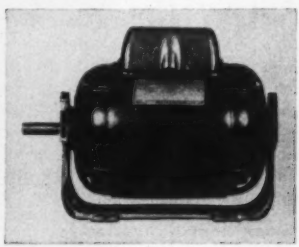
Self Contained Conditioners

HPAC 17—The new 1951 line of packaged air conditioners of Brunner Mfg. Co., Utica 1, N. Y., includes 3, 5, 7½ and 10 hp models.

Units are said to feature low speed, belt driven condensing units, all-copper counterflow condensers which are independent of the receiver and which assist in cooling the compressor compartment, and six row cooling coils of copper tubes with aluminum fins. A steam or hot water heating coil can be furnished as optional equipment. The blower fan assembly is an entirely separate unit mounted above the cooling coil. Units are equipped with all-aluminum expanded foil air filters of standard sizes.



Conditioner



Motor

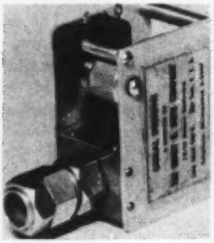
Motors With Resilient Base Construction

HPAC 18—The "Tri-Clad" line of single phase, capacitor, induction motors produced by General Electric Co., Schenectady, N.Y., is now being offered with a resilient base construction which is available on motors rated at from ½ to 5 hp. The base isolates torque pulsation so that it is not transmitted to the driven machine. Except for the 5 hp size, which uses 230 volts only, the

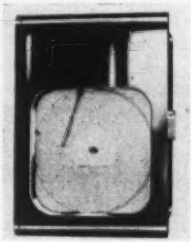
new motors operate on a 115 or 230 volt, 60 cycle power supply. Automatic reset thermal protective devices are available for use with the 1 and 5 hp, 1800 rpm models.

Air Flow Switch

HPAC 19*—A new vane type pressure air flow switch for use in forced air cooling of electronic equipment is being offered by Coral Designs Div., Henry G. Dietz Co., 12-16 Astoria Blvd., Long Island City 2, N.Y. This catalog 113 switch is designed to operate a control relay to guard against tube failure in the event of blower failure or air passage obstruction. It will operate on a minimum static pressure of 0.2 in. water gage and has a rating of 5 amp, 250 volts a-c.



Switch



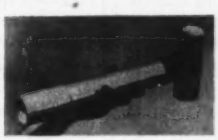
Recorder

Running Time Recorder

HPAC 20—A new line of running time recorders has been developed by The Bristol Co., Waterbury 20, Conn. Operating time is shown in hours, minutes and seconds on a chart record, and "off" periods are also shown as well as the time at which they occur. Models are available for wall or flush panel mounting or for portable use.

Duplex Thermostat

HPAC 21—For two position control of motor operated valves, pumps, relays and other heating system components, a new low voltage duplex thermostat has been developed by Barber-Colman Co., Rockford, Ill. It controls at reduced temperatures for night or non-occupancy periods. Control is changed from one thermostatic element to the other by an automatic time clock or a manual switch. Control settings can be varied from 45 to 75 F for night, 55 to 85 F for day operation, the manufacturer states. Stops inside the case may be set to limit or lock the control settings. The differential is 1½ to 2 F.



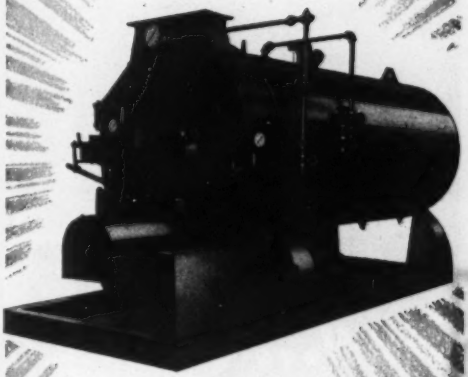
Above: Fiber Material

Left: Thermostat

Glass Fiber Tube and Pipe Material

HPAC 22**—A new glass fiber tube and pipe material, "Glasweld," designed as a replacement for steel and other critical metals in many commercial applications, has

YEARS AHEAD in Steam Generation



CYCLONIC COMBUSTION!

The slogan "Years Ahead in Steam Generation" is *Not* just an advertising phrase but is a statement of fact.

The truly amazing method of Cyclonic combustion has been proven successful by U. S. Industry and again by the Armed Services.

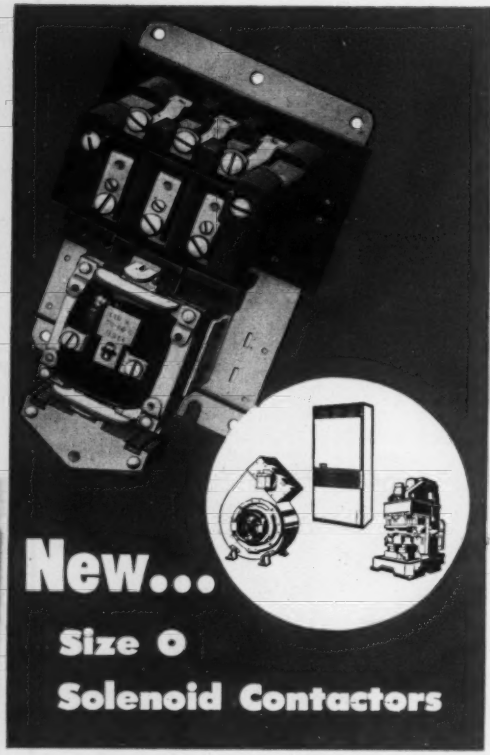
Full power operation from a cold start in 15 to 20 minutes. Savings up to 50% on maintenance. Great fuel operational savings.

Details of these and many other facts regarding Cyclotherm generators are available by writing Dept. N.

Boilers are designed for oil or gas operations from 18 thru 500 h.p., 15 to 200 lbs. operating pressure.

see our CATALOG in SWEET'S FILE

CYCLOTHERM STEAM GENERATORS OSWEGO, NEW YORK



...A-C or D-C... multi-pole construction... many more uses

Now you can get fast, positive, consistent operation on a *wide range* of load and control circuits... from the finest design of solenoid contactor on the market.

This new Size O a-c contactor brings Ward Leonard's line of solenoid contactors into the 15 ampere range. And it comes with as many as 5 poles. Double-break silver contacts may be interchanged to form normally-open or normally-closed contacts as desired.

Operating coils are interchangeable with Size 1 contactor coils. Available also with d-c "power plants".

Write for Bulletin 4458. WARD LEONARD ELECTRIC CO., 24 South Street, Mount Vernon, N. Y. Offices in principal cities of U. S. and Canada.

WARD LEONARD ELECTRIC COMPANY

Result-Engineered Controls Since 1892

RESISTORS • RHEOSTATS • RELAYS • CONTROL DEVICES

been developed by United States Plywood Corp., 55 W. 44th St., New York 18. The product is a laminated tubing in which glass fibers in the form of cloth, mat or tape are bonded with resins. It is said by the manufacturer to have the strength of steel and to be rust and corrosion proof. It is now available as piping in the oil and chemical processing industries and as tubing for building, electrical work and similar applications.

Window Sill Room Conditioners

HPAC 23—Three improved models of window sill room air conditioners are offered by Carrier Corp., Syracuse, N. Y.

A new hinged cradle-type mounting has been designed to reduce installation procedure to the placing of a few screws for the hinge and outboard supports. The entire conditioning unit slides in or out of the mounting for inspection and servicing. The cradle itself can be quickly removed or it can be swung inward, by removing wing nuts, so that the window can be lowered for washing.

Designed to provide cooling, dehumidification, air filtering, circulation, and ventilation, the three models are designated as Nos. 72, 106, and 130. Capacities are, respectively, 7200, 10,600, and 13,000 Btu per hr. All units have hermetic type compressors and adjustable air louvers.

The company's "Humitrol" for increased dehumidifying capacity is available this year for the first time as an optional accessory on room air conditioners. Complete thermostatic control is also available as an optional feature on all models.

Above: Conditioner
Right: Valve

Gear Driven Operator For Catalyst Slide Valves

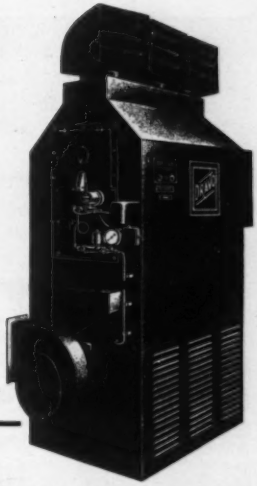
HPAC 24—Conoflow Corp., 2100 Arch St., Philadelphia 3, is offering its "Cono Rotomotor" in a new design for the operation of catalyst slide valves on throttling control services in the handling of spent and regenerated catalyst, in back pressure control of flue gases, catalytic cracking processes, etc.). This completely pneumatic gear driven operator works entirely from normal plant air supply. It is basically a self locking mechanism, but a continuously connected handwheel and a declutching lever provide for manual operation if it is desired. The tape type of positioning device permits long travels with accuracies of valve stem positioning to within 1/500 part of the total valve stroke, the manufacturer states. The operator is shown mounted on a valve yoke.

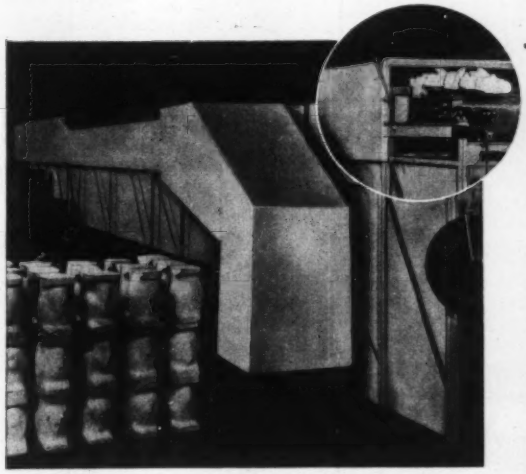
Adhesive Backed Felt Tape

HPAC 25*—"Kling Felt," a new reinforced felt tape with an adhesive backing, has been developed by Products Research Co., 5426 San Fernando Rd., Glendale 3, Calif.

"We cut processing time 55% by using DRAVO 'COUNTERFLO' Heaters in our medium-temperature curing and drying operations"*

*says . . . Mr. Eugene Salinger, Executive Vice President of Bayshore Industries, Elkton, Maryland





Here's how many Process Industries can profitably use DRAVO HEATERS

Although the major use of Dravo "Counterflo" Heaters is for space heating, these versatile heaters can easily be adapted to nearly any type of medium-temperature process drying and curing operations. Automatic temperature controls keep the hot air flow at required temperatures. Heaters warm up and cool down quickly; air can be recirculated, moisture-content of the air is controlled or removed entirely.

Here's where DRAVO Heaters are at work in medium-temperature process operations

- Curing and drying farm crops
- Drying wood containers
- Processing fibre containers
- Curing concrete pipe lining
- Curing in paper-making
- Processing of plastic toys
- Paint drying—automotive
- Paint drying—steel drums
- Kiln drying of wood products
- Curing neoprene backing of rugs
- Drying rugs after cleaning
- Auto "laundry" drying

Here's how BAYSHORE Industries profits by using Dravo Heaters

This leading manufacturer of rubber toy face masks uses two Dravo "Counterflo" Heaters, one on each of its production lines, to produce and circulate hot air at medium temperatures that dries and cures 66,000 masks daily.

The process consists of a conveyor system which moves through a duplex oven where temperatures are kept constant at 350° F. and 160° F., respectively. In addition to removing the 40% water content of the rubber mixture, the Dravo Heater cures rubber face masks in this 27-minute process, a 55% time reduction over the previous method used; this improved method of curing and drying has helped reduce the cost-per-mask.

Here's what DRAVO Heaters offer you

—Low initial cost . . . users report 50% to 60% savings.
—Heat delivery quickly and automatically adjusted to varying load requirements.
—Low Fuel consumption . . . burn gas or oil . . . easily converted.
—Automatic Control . . . on-off or modulating controls.
—Long service life, low maintenance . . . stainless steel combustion chamber.
—Mobility . . . easily moved to any location.
—Availability . . . immediate delivery . . . no delays.

WRITE FOR MORE INFORMATION—If you have a process heating and drying problem, it will be worth your while to look to Dravo "Counterflo" Heaters as a possible solution. Write today for booklet No. MN-526-465

DRAVO CORPORATION
HEATING DEPARTMENT, DRAVO BUILDING, PITTSBURGH 22, PA.
PITTSBURGH • CLEVELAND • PHILADELPHIA • DETROIT • NEW YORK • CHICAGO • ATLANTA • BOSTON
Sales Representatives in Principal Cities

Manufactured and sold in Canada by Marine Industries, Ltd., Sorel, Quebec

EXPORT ASSOCIATES, LYNCH, WILDE & CO., WASHINGTON 9, D. C.

—and for help with the temperature control, we'll talk to Honeywell!

Frankly, we'd hate to guarantee any plans drawn up by cartoonist Webb's mountaineers.

But they certainly have one mighty sound idea.

Honeywell *can* help heating engineers and contractors provide the proper thermal environment for any client—anywhere—in any kind of structure.

We have a lot of literature on the automatic control of all phases of heating, ventilating and air conditioning. Information you should have in your files.

And we have a lot of very well informed control engineers—in our 91 different offices—who have a lot *more* information right at their finger tips.

So, why not *talk to Honeywell?* Why not *write* to Honeywell for complete information on the equipment discussed in the column across the page? And why not do it *now?*

MINNEAPOLIS
Honeywell
First in Controls

The tape requires no paper or other separating material between layers, and the adhesive eliminates the need for gluing or tying. The tape is recommended for rattle deadening, sealing against dust, wind, etc., as a thermal insulator and in similar applications. It is available in rolls of from ¼ to 66 in. in width, and in thicknesses ranging from 1/64 to 1/4 in.

Aluminum Welding Rods

HPAC 26—For applications involving large amounts of pure aluminum, where an anodized silicon bearing welding rod shows a dark weld, Eutectic Welding Alloys Corp., 172nd St., and Northern Blvd., Flushing, New York, has developed its no. 22FC silicon free, flux coated aluminum welding rods for oxy-acetylene and oxy-hydrogen welding. The new rods are said by the manufacturer to provide a base metal matching solution, since corrosion resistance and color, as well as the physical properties of the weld, closely match the aluminum. The rod is manufactured in 1/8 and 3/16 in. diameters.

WE HEAR THAT . . .

TUBE TURNS, INC., Louisville, Ky., received an award for outstanding industrial advertising from the *NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION* at its recent annual meeting in New York. The award was made to *GENE WEDEREIT*, director of advertising, for a series of technical bulletins entitled Piping Engineering.

Employees of the South Greensburg, Pa., works of *WALWORTH CO.* have received the accident prevention award of Liberty Mutual Insurance Co. in recognition of their record of holding loss-time accidents to a point 62 percent below the average for the valves and pipe fittings industry for the year ending March, 1951.

FARR CO., formerly of Los Angeles, Calif., has moved to its newly completed main factory and office building in El Segundo, and full production has resumed. The new plant has more than double the manufacturing area of the previous one.

Recently the largest single shipment ever to leave the Portland, Me., airport was picked up by an AC-54 of the American Air Force Cargo Service. Shipment consisted of four BA1051 "Bakeraires" manufactured by *BAKER REFRIGERATION CORP.*, South Windham, Me., and consigned to the company's Mobile, Ala., distributor. The units are to be installed in the new Keesler Air Base instrument school at Biloxi, Miss.

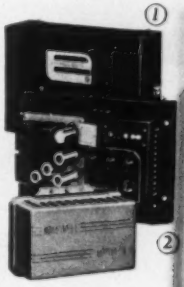
ANSUL CHEMICAL CO., Marinette, Wis., has extended its sales agreement with the *BETZ CORP.*, Hammond, Ind., which it will now represent in Indiana, Kentucky, Missouri, Kansas, Colorado, Wyoming and in parts of Michigan and Illinois.

THE STANDARD STOKER CO., INC., Erie, Pa., and its *READ MACHINERY DIV.* have announced a change of corporate name to *READ STANDARD CORP.* . . . . . *SUN-RAY BURNER MFG. CORP.*, Jamaica, N.Y., has appointed *OLIVER & BRINK*, 4423 Washington St., Roslindale, Mass., as its factory representative for the states of New Hampshire, Rhode Island and most of Massachusetts.

Personalized 8½" x 9" reproductions of this Webb cartoon are available upon request.
—and for help with the temperature control we'll talk to (your firm name)

For help with any control problem, talk to Honeywell!

Air conditioning, for instance...



By applying electronics to air conditioning control, Honeywell has produced a system that's years ahead in design!

It's the world's most sensitive air conditioning control — responds instantly to temperature change—no waste of warm or cool air. And it's much simpler— servicing is practically eliminated.

In addition to the electronic relay 1) and space thermostat 2), the system incorporates duct thermostats, immersion thermostats, and motorized valves and dampers.

This system costs less to operate, too — because only when outside air is too warm to use for cooling does the system call for refrigeration.

So whenever you're planning temperature control for stores, offices, restaurants, theatres or any other kind of structure, be sure to call for Honeywell Electronic Air Conditioning Control.

☐ Please send complete information on Honeywell Electronic Air Conditioning Control.
☐ Please send a personalized reproduction of the Webb cartoon.

Name _____ Firm Name _____

Address _____ City _____ Zone _____ State _____

Send this coupon today to Dept. HA-8-130, Minneapolis 8, Minn.

MINNEAPOLIS **Honeywell**

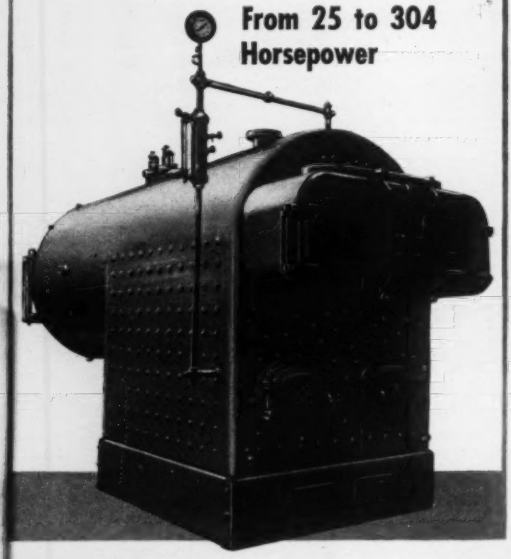
First in Controls

In One Compact UNIT . . .

DEPENDABILITY

for every need . . .

From 25 to 304 Horsepower



TITUSVILLE

ALL-WELDED WP-WPO

Firebox BOILERS

The *only* all-welded, return tube, firebox type high pressure boiler—providing leak-proof, troubleproof performance on continuous schedules for hospitals, institutions and industries. The Titusville Type WP-WPO Firebox Boiler is precision die formed and welded—built to ASME code with a 5-plus factor of safety—Standardized ratings, with large reserve capacity—gives excellent results with oil, gas or coal firing. Write for detailed, descriptive brochure.

THE TITUSVILLE IRON WORKS COMPANY

A division of Struthers Wells

TITUSVILLE, PENNSYLVANIA

Representatives in Principal Cities

BOSTWICK-BRAUN CO., Toledo, has been appointed distributor for the air filters manufactured by *OWENS-CORNING FIBERGLAS CORP.* The company's sales area comprises Ohio, Michigan and sections of Indiana and West Virginia.

The Detroit office of *MINNEAPOLIS-HONEYWELL REGULATOR CO.*, headquarters for the company's activities in Michigan and northwest Ohio, has moved to a newly completed office and warehouse building at 13631 Plymouth Rd.

L. E. PELLETIER AND ASSOCIATES, Newtown, Conn., has been appointed New England representative for *MAID-O-MIST, INC.*, Chicago. *HAVCO SALES CO.*, Port Chester, N.Y., has been appointed representative for Westchester, Putnam, Rockland, Orange and part of Dutchess counties, N.Y.

BRYANT HEATER DIV., AFFILIATED GAS EQUIPMENT, INC., has appointed the *DYKES CO., INC.*, 1012 Market St., Shreveport, La., as its distributor for northern Louisiana and parts of Texas and Arkansas.

H. R. ONARECKER AND CO., 2518 Times Blvd., Houston, Tex., has been appointed representative in the state of Texas for *CHELSEA FAN AND BLOWER CO.*, Plainfield, N.J. . . . . *KULJIAN CORP.*, Philadelphia, has moved its Washington D.C. office to larger quarters at 1832 K St. N.W.

BALDWIN-HILL CO., Trenton, N.J., has purchased the *TEX-ROCK INSULATION MFG. CO.*, Texas. The new division will manufacture and distribute the company's insulating blankets, pipe covering and other products. *GEORGE W. ELLIOTT*, formerly president of the Texas company, will continue as sales manager.

C. A. DUNHAM CO., Chicago, has started construction on a 22,500 sq ft addition to its plant in Michigan City, Ind. The new space will be used to produce high explosive artillery shells. . . . . The sales and engineering functions of the water treating section, *WORTHINGTON PUMP AND MACHINERY CORP.*, have been moved from the company's Dunellen, N.J. plant to its Harrison, N.J. plant.

The commercial-industrial segment of the oil burner industry has united as a group to promote the general interests of the manufacturers and the 500,000 users in this field, and to meet the needs of an expanding market. The commercial-industrial committee, manufacturer's division, *OIL-HEAT INSTITUTE OF AMERICA*, met recently in New York. Chairman *C. T. BURG*, vice president, Iron Fireman Mfg. Co., presided. The 20 people who attended represented 11 manufacturers of commercial and industrial oil burners. The next meeting is to be held in New York on September 11. Manufacturers wishing to be represented should communicate with the secretary of the institute at 6 E. 39th St., New York 16.

Construction has been started on the third unit of the new eight unit plant of *YORK-SHIPLEY, INC.*, York, Pa., on the company's Northills Rd. property. The completed project will occupy one half of the 40 acre tract.

KENNEDY

bronze globe and angle valves...

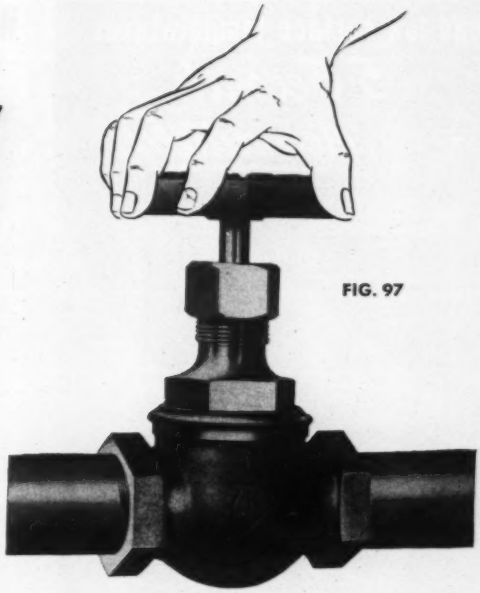


FIG. 97

JOB-FITTED with the *right* disc for every service

FIG. 98

TO ASSURE LONG, TROUBLE-FREE operation with easy maintenance, the complete KENNEDY Line is *job-fitted* . . . every valve specially designed and engineered for the job it has to do.

IN THE KENNEDY FIGS. 97 AND 98, for example, the disc is exactly matched to the job. To meet a wide range of fluid, temperature and pressure requirements, a variety of disc materials is available. Each is carefully selected for the service for which it is recommended.

THE RENEWABLE COMPOSITION DISCS give longer service because the extra height of the raised seats utilizes full thickness of the disc before replacement is necessary. The disc holder swivels on the stem to allow uniform wear on the disc.

THE MOLDED PACKING is self-lubricating and both Fig. 97 and 98 can be readily repacked under full line pressure.

THE HEAVY-WALLED BODIES are ruggedly built with full rounded contour. The stems are made with manganese bronze of 50,000 lb. tensile strength and have unusually heavy threads. Parts are fully interchangeable. Sizes range from ¼ to 3 inches with a working pressure of 125 lbs. saturated steam. WRITE FOR BULLETIN 56.

BUY FROM YOUR LOCAL DISTRIBUTOR

KENNEDY JOB-FITTED VALVES

THE KENNEDY VALVE MFG. CO.
ELMIRA, NEW YORK

VALVES • PIPE FITTINGS • FIRE HYDRANTS

read low surface temperatures
in 5 Seconds
Accurately!

on all jobs The Alnor Type 2300 is sturdy, self contained, easily carried and used anywhere. You'll find this instrument invaluable for balancing hot water heating systems, checking floor, wall or ceiling temperatures in panel heating systems, measuring temperature of refrigerated coils, insulation and all other low temperature surfaces.

quick accuracy Specially designed from Alnico magnet to the finest of quick-reacting thermocouples, the 2300 assures the highest standards of speed, accuracy and dependability—you can read any low surface temperature in 3 to 5 seconds under most conditions.

saves money The speed and precision eliminate time-wasting rechecking of heating systems. It is a direct reading unit—no conversion tables, balancing slide wires or batteries are necessary. It's easily read and understood—promoting greater accuracy.

Alnor PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Send Coupon For Full Information

Illinois Testing Laboratories, Inc.
Room 513, 420 N. LaSalle St., Chicago 10, Illinois
Please send me a copy of Bulletin 2146.

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Company.....

Address.....

City.....Zone.....State.....

WHO'S WHAT

W. PAUL JONES, president of *SERVEL, INC.*, Evansville, Ind., for the past two years, has also become chief executive officer of the company, succeeding *LOUIS RUTHENBURG*, who has held this office in addition to the chairmanship of the board. Mr. Ruthenburg, who asked to be relieved of the post because of the press of other duties, will continue as chairman of the board.

The new manager of the company's Chicago sales branch at 333 W. Lake St. is *WILLIAM K. GRUBE*, most recently assistant general sales manager in charge of merchandising. *E. A. STRASSBURGER* is now dealer sales manager for this branch, and *J. R. SPAHN* is office manager.

DR. FRED F. FLEISCHMAN recently was appointed sales engineer for the plant equipment sales dept., *CORNING GLASS WORKS*, Corning, N.Y. He will concentrate on promotion of the company's "Pyrex" brand glass piping for the dairy industry. His doctoral dissertation was based on a study of the use of the piping in dairy plants.

JOHN W. JAMES has been elected vice president in charge of research for *McDONNELL & MILLER, INC.*, Chicago. He joined the organization in 1948.

W. L. STEFFENS, sales manager, insulation division, *PHILIP CAREY MFG. CO.*, Cincinnati, who has been with the company since 1911, will retire January 1, 1952. He will be succeeded by *J. C. RECTOR*, now the Cincinnati district manager. Succeeding Mr. Rector, will be *W. H. SKINNER*, now assistant district manager. *J. O. McFALLS*, salesman for the organization, has been named to fill the vacancy created by Mr. Skinner's appointment.

CHARLES E. CRONE, Charles E. Crone Co., has been elected president of the *HEATING, PIPING & AIR CONDITIONING CONTRACTORS CHICAGO ASSOCIATION*. *JOSEPH S. KEARNEY*, Northwestern Heating & Plbg. Co., is the association's vice president, *CARL W. JOHNSON*, C. W. Johnson, Inc., is the treasurer, and *THOMAS KELLY*, Illinois Heating and Ventilating Co., Inc., is secretary. *THOMAS M. CUNNINGHAM* is executive secretary . . . . A dinner attended by some 250 members, national officers and guests followed the meeting held June 26 at the University Club, Chicago. *R. W. LAWINGER*, who was recently elected treasurer of the national association, was presented with a diamond ring in appreciation of his contributions to the Chicago association, which group he has served as president.

JOHN F. APSEY, JR., advertising manager of *THE BLACK & DECKER MFG. CO.*, Towson, Md., recently was elected president of the *NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION*, an organization which encourages high standards of advertising among manufacturing firms which sell their products to other than the consuming public.

"Let's look in this window, Grandma...

the sidewalk's dry"

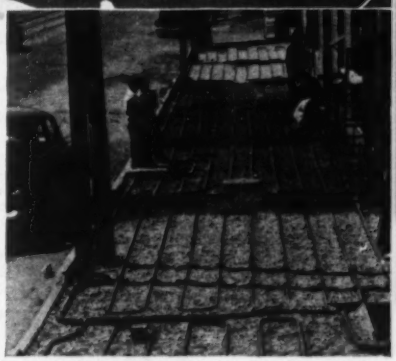
Steel Pipe is first choice for snow melting

There's an old saying that "business goes where it is invited and stays where it is well treated." Yes, the considerate ways of doing business are also the profitable ways! Successful business men know that thoughtfulness for the comfort and convenience of the customer helps ring cash registers as much as the price tag or quality of merchandise.

So, high on the list that "wins friends and influences people", along with such known sales builders as air conditioning, adequate parking, good lighting, and modern rest rooms, is *sidewalk and parking area snow melting!*

Steel Pipe is first choice for these installations. You see, Steel Pipe, as the hot water circulating system, has all the desirable working characteristics required for a successful snow melting system. That means durability, formability, weldability and suitability . . . plus maximum economy!

A free 48-page color booklet "Radiant Panel Heating with Steel Pipe" is now available to you. Write for a copy.



A typical sidewalk snow melting installation showing an effective layout of steel pipe coils.

Steel Pipe is First Choice

COMMITTEE ON STEEL PIPE RESEARCH

AMERICAN IRON AND STEEL INSTITUTE

350 Fifth Avenue, New York 1, N.Y.

Look here *first* when specifying expansion joints

Just "flexing" is not enough . . . it's Directed-Flexing Self-Equalizing — an exclusive Badger Mfg. Co. feature — that makes the real difference in expansion joint performance. The enlarged cross-section above shows the corrugated member in the unique *all-curve* pattern . . . no sharp bends or structure-weakening stresses . . . no danger of premature breakdown.

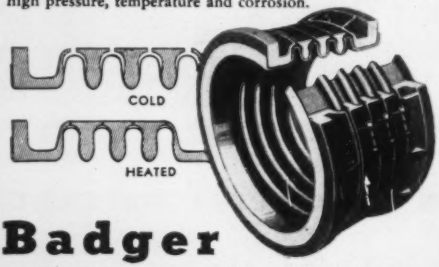
When combined with the correspondingly shaped Badger Self-Equalizing ring, a progressively controlled movement of each corrugation guarantees a more flexible longer lasting joint — a joint that succeeds where others fail. Get detailed information on the Badger Expansion Joint by writing today. Specify Badger Expansion Joints for every job.

Only Badger Expansion Joints have Directed-Flexing Self-Equalizing rings which progressively control the movement of the all-curve corrugations.

Plus 5 other big features

- Packless . . . pressure-tight single tube — requires no maintenance
- Compact . . . approximately the size of flanged fitting
- Special forming . . . no structure-weakening stresses
- Controlled heat treating . . . assures long life
- Wide range of traverse — pressure — temperature

Fabricated from deoxidized copper for normal pressures and temperatures, stainless steel alloys to withstand high pressure, temperature and corrosion.



Badger

MANUFACTURING COMPANY

230 BENT STREET, CAMBRIDGE, MASS.

The *AIR CONDITIONING AND REFRIGERATING MACHINERY ASSOCIATION* has elected as its new president *FRED W. SMITH*, president, Baker Refrigeration Corp., South Windham, Me. Elected as vice presidents were *C. S. STACKPOLE*, vice president and general sales manager, Airtemp Div., Chrysler Corp., Dayton, O., and *H. B. DONLEY*, manager of marketing, General Electric Co., Bloomfield, N.J. *G. A. HEUSER*, president, Henry Vogt Machine Co., Louisville, Ky., was re-elected as treasurer.

Two new field representatives have been named for *TEMPERATURE CONTROLS DIV., PERFEX CORP.*, Milwaukee. *GEORGE A. LeFEVRE*, most recently branch manager for another control company, and formerly associated with the Cities Service Co. is the new district representative for the New England and Middle Atlantic states. *WILLIAM O. ELLWOOD*, previously sales representative for another control manufacturer, and before that with Bethlehem Steel Co., will serve as district representative in the Buffalo area.

ROBERT W. ENGBRING has recently been appointed to the Perfex staff as advertising manager. Most recently he has been advertising and sales promotion manager of the K. O. Lee Co. of South Dakota.

ROBERT T. HUYCK has been appointed manager, industrial gas burner division, *ROBERTS-GORDON APPLIANCE CORP.*, Buffalo, N.Y. to succeed the late *CARL O. NORDENSSON*.

J. C. LINSENMEYER, works manager since 1946, recently was elected vice president in charge of manufacturing for *AMERICAN BLOWER CORP.*, Detroit. *JOHN BRENNAN*, formerly manager, hydraulic coupling div., has been appointed chief engineer, and *BENJAMIN RAGLAND*, who has been with the Chicago office, succeeds him in that post. *E. W. PETERSEN*, formerly a merchandise manager for the heating and ventilating divisions, has been promoted to the new position of assistant general sales manager.

ALFRED IDDLES, president, *THE BABCOCK & WILCOX CO.*, New York, N.Y., was awarded the honorary degree of Doctor of Engineering by *POLYTECHNIC INSTITUTE*, Brooklyn, at the 96th annual commencement.

I. MELVILLE STEIN has been elected to the newly created post of executive vice president of *LEEDS & NORTHRUP CO.*, Philadelphia. Mr. Stein has been a vice president, and is director of research for the company, which he joined in 1919.

S. D. BAUMER has been appointed vice president of the *AIRCO EQUIPMENT MFG. DIV., AIR REDUCTION CO., INC. EDWARD H. ROPER* has been appointed manager of the general technical sales department of another of the company's divisions, *AIR REDUCTION SALES CO.*

The new national secretary of the distribution division, *OIL-HEAT INSTITUTE OF AMERICA, INC.*, is *FRED*

GOING FAST!

this 28-pag[illegible] full of useful metal joining information

ALWAYS USE HANDY FLUX with EASY-FLO and SIL-FOS . . .

to get the full benefit of the low flow points of these alloys which go from 1145°F to 1300°F. At 1100°F. HANDY FLUX is fully liquid and active and dissolves practically all refractory oxides, chrome oxide included. In addition, HANDY FLUX has excellent cleaning properties and washes off readily in hot water after brazing. In convenient paste form, it is easy to brush on and stays put. For details write for Bulletin No. 20.

■ Requests for this new bulletin have been pouring in. And scores of letters have come in from design and production engineers praising the clear and complete way in which it presents the facts about low-temperature silver alloy brazing. Many of them say the information in the bulletin — particularly on joint design and on fast brazing production methods — has enabled them to speed up and improve some of their own metal joining work. Don't miss out—write for a free copy of Bulletin 20 today.

HANDY & HARMAN

82 FULTON STREET NEW YORK 38, N. Y.

BRIDGEPORT, CONN. • CHICAGO, ILL. • LOS ANGELES, CAL. • PROVIDENCE, R. I. • TORONTO, CANADA • AGENTS IN PRINCIPAL CITIES

S. BURROUGHS who formerly had operated his own companies in the distribution and manufacturing fields and previous to that had been with Shell Oil Co., Inc., as assistant to the manager of public relations.

The 34th annual meeting of the *STOKER MANUFACTURERS ASSOCIATION* was held recently at Lake Wawasee, Ind. The golf championship was again won by *C. T. BURG*, president, and the associate membership golf winner was *ALBERT PENN*, president, Penn Electric Switch Co. The incumbent officers, all re-elected for the ensuing year, are: president, *C. T. BURG*, Cleveland, O., vice president in charge of sales, Iron Fireman Mfg. Co.; vice president, *L. C. DUBS*, Canton, O., president and general manager, Canton Stoker Corp.; secretary-treasurer, *T. A. CRAWFORD*, Detroit, Mich., vice president, Timken Silent Automatic Div., Timken-Detroit Axle Co. *MARC G. BLUTH*, Chicago, was reappointed as executive secretary.

AMERICAN WHEELABRATOR & EQUIPMENT CORP., Mishawaka, Ind., has reorganized and expanded its sales staff at the executive level. *L. L. ANDRUS*, formerly vice president in charge of sales, is now vice president and executive head of the dust & fume division. *JOHN A. SILVER*, formerly with Lester and Silver, management and sales consultants, is the new director of sales, and *E. B. RICH*, Chicago representative of the company, has been named general sales manager. *A. E. LENHARD*, advertising and sales promotion manager is now in charge of market research and *S. S. DEPUTY*, sales manager, has been given special executive and sales assignments.

HERBERT B. LINK, executive vice president since 1939 of *THE BELLOWS CO.*, Akron, O., has been named president of the company. He succeeds *L. F. R. BELLOWS* who died recently. *L. F. R. BELLOWS, JR.*, Detroit, Mich., has been named vice president, and *BYRON D. KUTH*, Cleveland, secretary-treasurer. The same officers were named for the organization's two affiliated companies, *BELLOWS PRODUCTS, INC.* and *THE BELLOWS ELECTRIC SIGN CORP.*

ROBERT M. LUNDGREN has been appointed vice president of *THE KULJIAN CORP.*, Philadelphia. He will be in charge of the firm's sales program. . . . *FRED RIEDEL* is the new chief engineer for *BAKER REFRIGERATION CORP.*, South Windham, Me. Previously, he was chief engineer of the air conditioning and refrigeration div., Worthington Pump and Machinery Corp.

ALBERT J. NESBITT, president, *JOHN J. NESBITT, INC.*, Philadelphia manufacturers of heating and ventilating units, has been elected to the board of trustees of the *PENNSYLVANIA STATE COLLEGE* for three years.

The new sales engineer for the Philadelphia district office of *PENN ELECTRIC SWITCH CO.*, Goshen, Ind., is *C. P. PESTOW*, who has been with the company for 11 years. *JAMES F. KINNEY*, formerly a sales engineer at Goshen, has been appointed manager of the district

TWO MORE STANDARDS *in Modern* VENTILATION by PENN

Liberty® VENTILATOR

LIBERTY VENTILATOR . . . a reliable standard for modern ventilation. All the air currents—upward, downward, horizontal or swirling—are converted into powerful suction forces by ingenious arrangement of baffles & wind vanes. Capacity Ratings, based on all-angle wind tests*, prove the Liberty free from backdrafts!

*United States Testing Co., Inc. Test #E-1532-9-11-50

Penn DYNAFAN®

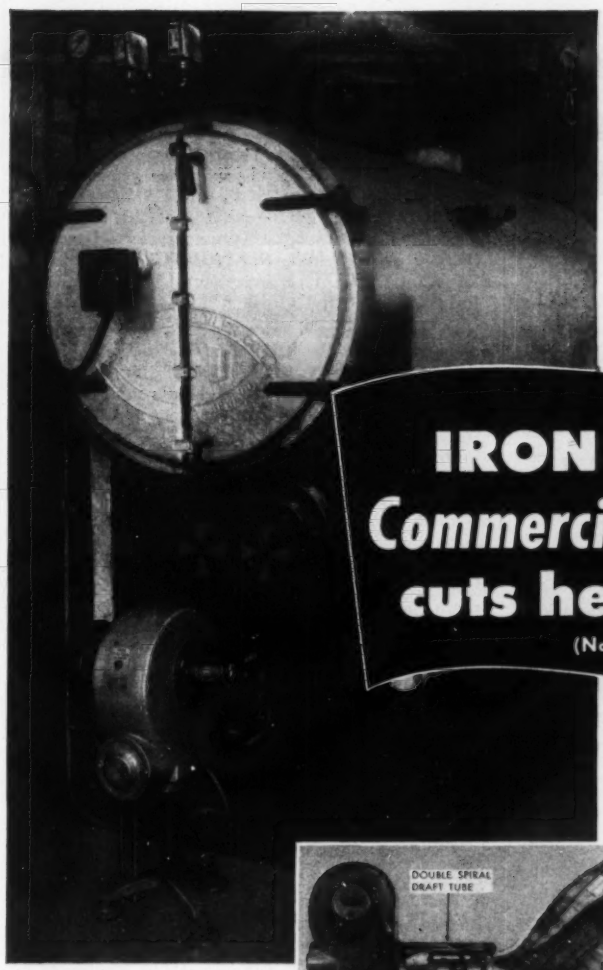
DYNAFAN . . . engineered for quiet air removal where static pressure and other special conditions are encountered.

- Motors out of air stream!
- Units are low—blends well with modern architectural design!
- Operating parts easily accessible!
- Statically and dynamically balanced non-overloading fan!

Write for complete literature today!
Representatives and Distributors In Principal Cities

FOR MORE THAN 25 YEARS THE BUILDERS' TOP LINE

PENN VENTILATOR CO.
PHILADELPHIA 40, PA.

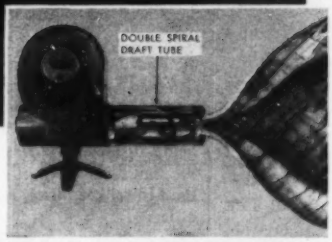


Can you afford to waste what Iron Fireman users are saving?

IRON FIREMAN *Commercial* OIL BURNER cuts heating costs

(No. 2 oil or lighter)

This steel heating boiler in one of the Portland (Oregon) plants of the Air Reduction Pacific Co., a division of Air Reduction Co., Inc. is equipped with an Iron Fireman Commercial oil burner. Iron Fireman pressure regulators (visible above boiler) are part of automatic control system. Capacities up to 65 boiler horsepower.



A careful inspection of the Iron Fireman commercial oil burner will show its advanced engineering design and the high quality of its materials and workmanship. Long years of dependable, economical operation are built into every burner.

Precision oil and air control are important engineering features, since these make possible the burner's top fuel economy. Iron Fireman oil burners have many extra values which appeal to careful, far-sighted owners of heating plants.

One example of advanced Iron Fireman engineering is the double spiral draft tube. This produces two air cones—one within the other—rotating in opposite directions. The result is maximum turbulence and excellent air and oil mixture for greater fuel economy.

You can get further information on this great Iron Fireman oil burner by calling your local dealer, or by mailing this coupon.

Other Iron Fireman equipment for coal, heavy oil, gas

Iron Fireman Coal-Flow Stoker
Feeds coal direct from bin. No coal handling. Coal and air automatically adjusted to boiler load at all times. Capacities to 400 boiler horsepower.

Iron Fireman Rotary Oil Burner
Fires low-cost, heat-rich heavy oils (5 & 6) with complete steadiness and dependability at varying oil temperatures. Capacities to 500 boiler h.p.

Iron Fireman Commercial Gas Burner
Vertical type is illustrated above. Others include Radiant Inshot and Ring types. Flexible operation, easy to install. Capacities to 400 boiler h.p.

IRON FIREMAN

AUTOMATIC FIRING EQUIPMENT FOR OIL, GAS, COAL

IRON FIREMAN MANUFACTURING COMPANY
3157 West 106th Street, Cleveland 11, Ohio.

Please send literature as checked:

☐ Commercial Oil Burner ☐ Rotary Oil Burner
☐ Coal-Flow Stoker ☐ Commercial Gas Burner

Let Iron Fireman engineers help decide which fuel is best for your plant.

*Name*_____

*Address*_____

*City*_____

*State*_____

2 ways to CUT assembly costs!

DRILL IT! with a B & D HOLGUN. Drills holes to ¼" diameter in steel to ½" in hardwood.

DRIVE IT! with a B & D SCRUGUN. Drives machine screws and nuts to ¼", self-tapping screws to #12, wood screws to #10 x 2". Positive or adjustable clutch available.

B & D HOLGUNS*, SCRUGUNS* give you MORE WORK

Per MAN These Tools are perfectly balanced, weight saving, compact, with famous "Pistol Grip and Trigger Switch". Accurate and easy to handle. Help your men produce more, with less fatigue and less work spoilage.

Per HOUR Abundantly powered by B&D universal motors, they have full power and speed for continuous use—help you do more sheet metal assembly per hour, *every* hour!

Per TOOL These Tools give you *extra* years of service! Extra-tough gears, shaft and chuck spindle, powerful motors, husky housings are *built to last!*

WRITE TODAY for free, detailed catalog to: THE BLACK & DECKER MFG. CO., 628 Pennsylvania Ave., Towson 4, Md. *Trade Mark Reg. U. S. Pat. Off.

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

ELECTRIC SHEARS | ELECTRIC SANDERS | BENCH GRINDERS | "WHIRLWIND"® WIRE BRUSHES

office in Cleveland. The company has established a new office in Pittsburgh, at 704 Kewanna Ave., Mt. Lebanon. It will be managed by *A. B. RALPH*, formerly with Surface Combustion Corp.

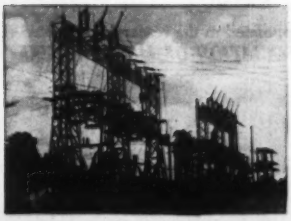
A. RUST-OPPENHEIM, president, *ANEMOSTAT CORP. OF AMERICA*, has been appointed representative for railroad suppliers on the executive council of the *FEDERATION FOR RAILWAY PROGRESS* . . . . . *REMINGTON CORP.*, Auburn, N.Y., and *PHILCO CORP.*, Philadelphia, recently have become members of the *AIR CONDITIONING AND REFRIGERATING MACHINERY ASSOCIATION*, Washington, D.C.

Five men have been promoted in a sales department expansion move of the *KAYLO DIV., OWENS-ILLINOIS GLASS CO.*, Toledo, O. *A. V. BABER*, with the company since 1943, has been made manager, heat insulation sales. *H. E. CASEY*, who joined the company in 1942, is now manager, structural product sales. *P. W. BOYD*, who was with Frigidaire Div., General Motors, before joining the company this year, has been given the new post of supervisor, laminated products. *E. C. SHUMAN* has the titles of director of research and manager, product development. At one time he was manager of the company's plant at Berlin, N.J. In addition to being manager of sales control, *W. R. LUGAR* will now be general branch manager. He joined the company in 1941.

At a recent annual meeting of the *NATIONAL ASSOCIATION OF FAN MANUFACTURERS, INC.*, the following directors were elected for the ensuing year: *H. E. BARTH*, American Blower Corp., Detroit; *J. M. FRANK*, Ilg Electric Ventilating Co., Chicago; *J. C. THOMPSON*, Westinghouse Electric Co., Sturtevant Div., Boston; *E. E. TRICKLER*, The New York Blower Co., Chicago; and *L. O. MONROE*, Detroit. At a subsequent meeting of the board of directors, Mr. Frank was elected president, Mr. Trickler, vice president and Mr. Monroe, secretary-treasurer.

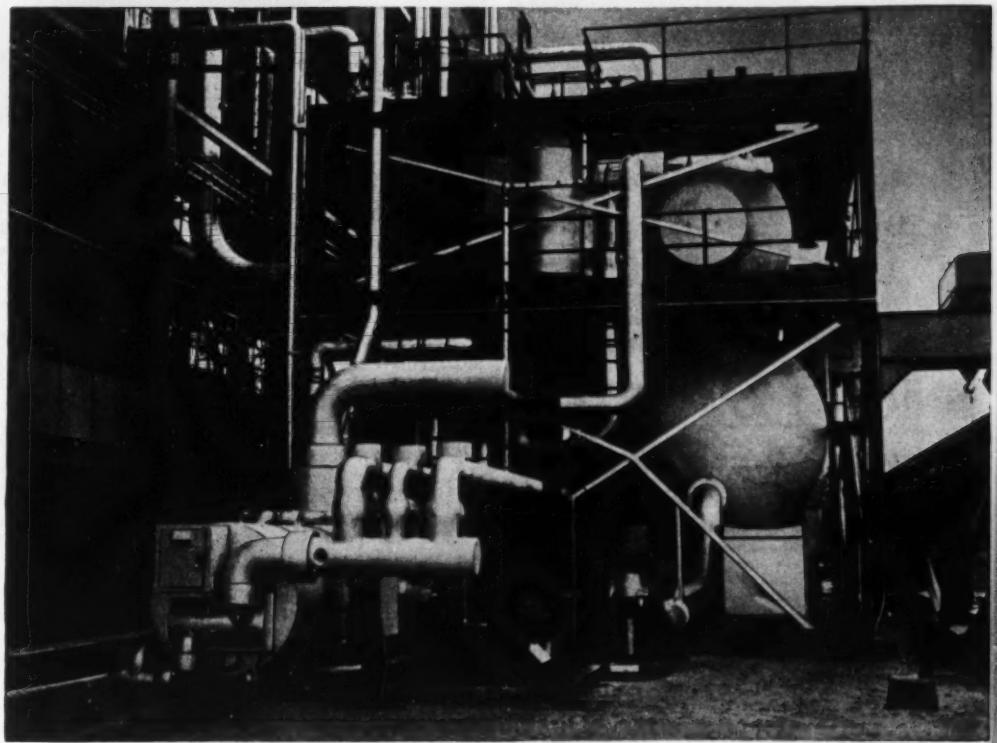
GENERAL CONTROLS CO., Glendale, Calif., has expanded its field engineering force. Managers have been selected for three of the five new factory branch offices being opened. *JOHN FERGUSON* will be in charge of the Salt Lake City office, *ALBERT SMITH* will manage the Milwaukee office, and *ELTON BARNETT*, the Omaha office.

Under the company's new district procedure, several factory branch offices will be supervised by a district manager. The New York district, covering the New York and Newark, N.J. offices, will be supervised by *F. J. WENGERTER*. *FRED ANGIER* will be in charge of the Philadelphia district, covering Philadelphia and Baltimore. The Cleveland district, including Cleveland, Columbus and Buffalo, will be directed by *CHARLES TABOR* and the Chicago district, including Chicago, Minneapolis, Milwaukee and Indianapolis, by *BUD LERCH*. Director of the Denver district, covering Denver, Salt Lake City and El Paso, will be *HERBERT LINDSTROM*, and *A. E. HESS* will supervise the Houston district, covering Houston and New Orleans.



Where heat is a production tool!

—Carolina Power and Light Company uses K&M Insulations in Lumberton Plant



Steam plant, Carolina Power and Light Co. Lumberton Station. Shown are evaporator, evaporator pre-heater, deaerating heater, and storage tank. "Featherweight" 85% Magnesia used to insulate surfaces up to 600°F.; used in combination, with K&M Hy-Temp to insulate surfaces above 600°. Weatherproof finish. ENGINEERS AND CONSTRUCTORS: Ebasco Service, Inc., INSULATION CONTRACTORS: Guy M. Beaty Company, Charlotte, N.C.

These Keasbey & Mattison Insulations deliver more steam at less cost!

You'll find Keasbey & Mattison insulations—K&M "Featherweight" 85% Magnesia, and K&M Hy-Temp—wherever exacting steam temperature control is a must—in power stations, steamships, oil refineries, chemical plants, hospitals. These two insulations have a reputation for their cost cutting services—"Featherweight" 85% Magnesia for temperatures up to 600°F.; and in combination with K&M Hy-Temp Insulation when difficult heat control situations arise in the temperature range from 600°F. to 1900°F.

Your Keasbey & Mattison Distributor, who is an experienced applicator, will be glad to give you complete information on any of the K&M Insulations for the 40°F. to 1900°F. service range. Or, write us.

Nature made Asbestos...
Keasbey & Mattison has made it serve mankind since 1873

K&M Best in Asbestos

KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

Lo-BLAST Burners heat this huge Cincinnati apartment building.

FOR EVERY TYPE OF BUILDING

LO-BLAST

IS THE LOW-COST WAY TO HEAT WITH GAS

Every dollar trimmed from operating expense shows up on the profit side of the ledger. That's why fuel-saving Lo-BLAST Power Gas Conversion Burners are the sensible selection for buildings which must produce income . . . or for home owners concerned with keeping living costs down.

Lo-BLAST operating cost averages 10% less

The Lo-BLAST principle of combustion utilizes an extremely quiet, low speed blower to provide perfectly controlled primary and secondary air. Hence operation is always independent of natural draft conditions—makes the Lo-BLAST ideal for down-draft boilers. Combustion is completed in an incandescent firebox, with radiant heat applied to the crown sheet as well as side walls. There's no combustion roar—the flame is soft and *quiet!*

High efficiency on intermittent operation

Lo-BLAST Burners show only a small drop in over-all efficiency when changing from constant to intermittent operation. This is the reason for Lo-BLAST fuel economy, since intermittent operation is the normal condition for any heating plant.

Lo-BLAST Economite

Residential size—70,000 to 300,000 BTU—with all the fuel-saving features of the standard Lo-BLAST.

Factory-tested on gas, shipped completely assembled

Installation and servicing are easy *because there's nothing in the firebox but the fire!* All units have standard controls with positive acting pilot and blower safetys.

Capacities from 70,000 to 20,000,000 BTU input. Write for engineering data.

MID-CONTINENT
METAL PRODUCTS CO.
1960 N. Clybourn Ave., Chicago 14, Ill.

RENE D. WASSERMAN, director of research and president, *EUTECTIC WELDING ALLOYS CORP.*, Flushing, N.Y., has been appointed to the research committee of the *NATIONAL ASSOCIATION OF MANUFACTURERS.*

C. T. MILLER, formerly sales manager, appliance div., *RHEEM MFG. CO.*, is now assistant general sales manager. *RALPH W. COOKE*, central regional sales manager in Chicago, will be transferred to New York, succeeding Mr. Miller. *WILLIAM S. GOODFELLOW*, assistant western regional sales manager, will succeed Mr. Cooke in Chicago.

BEN W. RIST has been appointed sales manager for *HEAT-X-CHANGER CO.*, Brewster, N.Y. He has been midwest manager for the past two years and previously was associated with the Fred C. Kramer Co., Chicago.

WILLIAM V. O'BRIEN, a commercial vice president of *GENERAL ELECTRIC CO.*, Schenectady, N. Y., has been appointed manager of the firm's apparatus marketing division. He succeeds *CHESTER H. LANG*, vice president, who now heads the company's public relations organization.

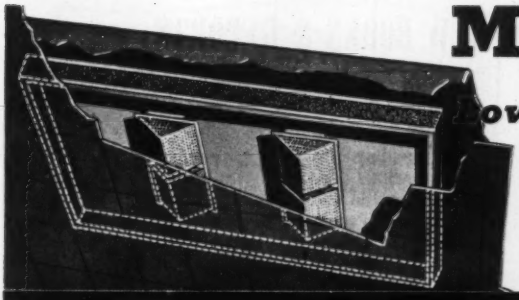
THE ATOMIC ENERGY COMMISSION has established a *DIVISION OF CONSTRUCTION AND SUPPLY. EDWARD J. BLOCH*, former deputy director of the division of production, is the new director. *FREDERICK H. WARREN* is the new deputy director and *JOHN R. BRINDEL* is assistant to the director. *NEIL J. CAROTHERS, JR.*, has succeeded Mr. Bloch in his former post and *JAMES L. KELEHAN* has been appointed assistant director, division of production.

The new division will be responsible for staff supervision of the Commission's construction and related engineering activities. It will also administer priorities, allocations, and the controlled materials plan for the AEC.

HECTOR P. BONCHER has been elected a vice president of *DRESSER INDUSTRIES, INC.*, Dallas, Tex. He is general manager of *DRESSER MFG. DIV.*, one of ten operating companies of the corporation, a position he has held since 1942.

TIMKEN SILENT AUTOMATIC DIV., Jackson, Mich., of *TIMKEN-DETROIT AXLE CO.*, has appointed two new district sales managers: *CARL W. WRIGHT*, whose territory includes the south Atlantic states, and *ANDREW P. KELLY*, who will handle western Pennsylvania.

RUSSELL G. DAWLEY, former assistant sales director, *NORMAN PRODUCTS CO.*, Columbus, Ohio, has been named sales director.....L. M. EVANS has been put in charge of the new Rochester, N. Y. branch office of *WORTHINGTON PUMP AND MACHINERY CORP.*, of Harrison, N. J.....*ARCH J. COCHRANE*, of Hammond, Ind., a veteran of more than 25 years in the steel business, has been appointed assistant manager of Chicago district operations for *THE YOUNGSTOWN SHEET AND TUBE CO.*, Youngstown, Ohio.



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Low Velocity Air Diffusion CEILING PANELS

Operating Rooms
Environment Control Rooms
Delivery Rooms

solve the *really tough* Air Distribution problems in hospitals

Psychiatric Wards
Nurseries
Laboratories
Psychometric Rooms

Multi-Vent Ceiling Panels have been specified for the new addition to the UNIVERSITY OF ILLINOIS RESEARCH AND EDUCATIONAL HOSPITALS, Chicago
Architects • Holabird, Root & Burgee, Chicago
Consulting Engineers • E.P. Heckel & Assoc., Chicago

Recent MULTI-VENT installations

MAYO BROTHERS CLINIC, Rochester, Minnesota
CHICAGO LYING-IN HOSPITAL, Chicago, Illinois
YAKIMA VALLEY MEMORIAL HOSPITAL, Yakima, Wash.
FRESNO COUNTY HOSPITAL, Fresno, California
NEW L.D.S. PRIMARY CHILDREN'S HOSPITAL, Salt Lake City, Utah
CHICAGO STATE T. B. SANATORIUM, Chicago, Illinois
ST. JOSEPH MEMORIAL HOSPITAL, St. Joseph, Mich.
T. B. HOSPITAL, Ohio State University Medical Center
ST. VINCENT'S HOSPITAL, Santa Fe, New Mexico
SAMARITAN HOSPITAL, Ashland, Ohio
NATIONAL INSTITUTE OF HEALTH, Bethesda, Maryland
ROSE MEMORIAL HOSPITAL, Denver, Colorado
ELIZABETH STEEL MAGEE HOSPITAL, Pittsburgh, Penn.
A.E.L. BUILDING #599, U. S. Naval Base Philadelphia, Pa.
BEAR LAKE MEMORIAL HOSPITAL, Montpelier, Idaho
L.D.S. HOSPITAL X-RAY DIVISION, Salt Lake City, Utah
RAVENSWOOD HOSPITAL, Chicago, Illinois
UNIVERSITY HOSPITAL, Omaha, Nebraska
BENSON SWIFT COUNTY HOSPITAL, Benson, Minnesota
SOUTHSIDE HOSPITAL, Bay Shore, L.I., N.Y.
ANOKA T. B. STATE HOSPITAL, Anoka, Minnesota
BINGHAM MEMORIAL HOSPITAL, Blackfoot, Idaho
MOUNT VERNON T. B. HOSPITAL, Mount Vernon, Illinois
PHELPS COUNTY HOSPITAL, Rolla, Missouri
MENOMONIE HOSPITAL, Menomonie, Wisconsin
STATE OF WISCONSIN—GENERAL HOSPITAL, University of Wisconsin
ST. JOSEPH'S HOSPITAL, Hancock, Michigan
IVINSON HOSPITAL, Laramie, Wyoming
BYBERRY STATE HOSPITAL, Tubercular Patients Building N-10
NEW MOUND PARK HOSPITAL, St. Petersburg, Florida
HEART HOSPITAL, University of Minn., Minneapolis, Minn.
JUAB COUNTY HOSPITAL, Nephi, Utah
SOMERSET STATE HOSPITAL, Somerset, Penn.
GILLETTE HOSPITAL, St. Paul, Minnesota
GADSDEN COUNTY HOSPITAL, Quincy, Florida
UNIVERSITY OF ILLINOIS, PHYSICAL ENVIRONMENT LABORATORY Urbana, Illinois
CHESTNUT HILL HOSPITAL, Philadelphia, Pa.
UNIVERSITY OF CALIFORNIA, Medical School—Teaching Hospital
PASTEUR MEDICAL BUILDING, Oklahoma City, Okla.
OAKWOOD HOSPITAL, Detroit, Michigan
COLEMAN HOSPITAL, Indianapolis, Indiana
STANISLAUS COUNTY HOSPITAL, Modesto, Calif.
UNIVERSITY OF CALIFORNIA, Virus Laboratory

✻ See SWEET'S Arch. & Eng. Files or Write for detailed literature and the name of the Multi-Vent sales engineer in your vicinity.

Hospital medical staffs and technicians are rapidly recognizing that the Multi-Vent panel is *the* one air diffuser that can surely meet, even surpass, their rigid air distribution requirements for air conditioning these critical hospital areas.

The success Multi-Vent has achieved in these nurseries, laboratories, operating rooms, etc. of outstanding hospitals throughout the country, is proof of Multi-Vent's ability to provide truly perfect air conditioned comfort in offices, theatres, stores, restaurants and all other types of institutional or commercial buildings . . . where the best in air distribution is desired.

Multi-Vent's unique pressure displacement principle of air distribution is completely free from BLOW or THROW (high velocity injection), the main source of draft hazards . . . thereby eliminating all of the most serious installation, balancing, and adjustment problems inherent in the velocity injection principle upon which all air diffusers except Multi-Vent depend.

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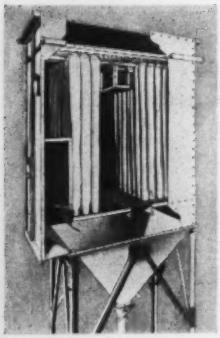
Control Dust at a PROFIT with a DUSTUBE



Dust control with a Dustube is a more profitable operation because it cleans the air at an unusually low cost. It removes dust with nearly 100% efficiency by actual test. Its unique, simplified design is responsible for many cost saving advantages that thousands of users have found outstanding.

Lower Resistance to Air Flow REDUCES POWER COSTS

The resistance to air flow (back-pressure) is much lower in a Dustube than in any other cloth type collector of equal capacity. This means important savings for you in lower power costs because power consumption varies in almost direct proportion to the back-pressure.

Simplified Design REDUCES MAINTENANCE COSTS

The Dustube requires practically no maintenance. There are few working parts to wear. Filter tubes are ready for instant inspection from the clean air side—nothing need be disassembled to do this. When an occasional tube replacement is needed one man can do the job in a few seconds—he needs no tools whatever.

SEND FOR FULL DETAILS TODAY

American WHEELABRATOR & EQUIPMENT CORP.
619 S. Byrkit St., Mishawaka, Ind.

dustube COLLECTORS

NEW BOOKS & REPORTS

Handbook Covers Civil Defense in Office Buildings

The Building Managers' Association of Chicago, 38 S. Dearborn St., Chicago 3, has published A Handbook for Civil Defense in Office Buildings, which was prepared by the association's civil defense committee for the guidance of its members. The association recommends that its member buildings adopt and carry out as far as is practicable the procedures recommended in the handbook until superseding instructions are issued or until the present emergency is declared to be over.

One of the recommendations is that all machinery and waste paper rooms, building shops, penthouses and roof access doors be kept locked at all times and that boilers, engines, generators, switchboards, pumps, fans, refrigeration equipment, standpipe control valves, elevator machinery, utility cables, and other vital equipment be particularly well guarded, and if possible, be kept under lock and key. Firemen should be instructed to be on the lookout for foreign material such as dynamite sticks and other explosives, for tramp iron or other objects calculated to damage the equipment.

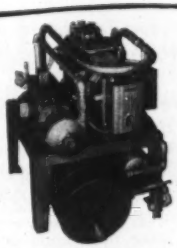
Problems of ventilation should be given particular attention in connection with designating building areas as air raid shelter space, particularly if the basement is used for this purpose. It is recommended that only the first basement be used for shelter area as sub-basements in Chicago are generally below the level of sewers.

In the section on turning off building switches it is stated that it is well at the onset of a raid to shut off the combustion equipment in the basement by switching off the stoker or oil burners, or banking the fires, so that the boilers will be inactive and quickly relieved of pressure. This is to guard against damage and injury from broken steam pipes, damaged boiler feed piping, lack of water, or other contingencies. It also relieves the basement crew of having to attend the boilers. The oil pressure pumps in an oil-fired plant should be shut down — with one exception. Where there are water pumps operated from steam pressure, it may be necessary to maintain the steam pressure so that these pumps can be operated in case the electric pumps are disabled by failure of the power supply.

Partly to prevent flooding and partly to prevent loss of pressure in the city mains due to waste of water out of shattered piping, it is suggested that it may be desirable to shut off the city water upon the sounding of an alarm. Judgment will indicate whether this is necessary, and also when it may be turned on again.

In order not to circulate contaminated gases and radioactive dust through the building, upon receipt of an alarm, all air conditioning and ventilating systems should be shut down.

The supply of gas to the building should be shut off. In some buildings there is no shut-off cock internal to the building. In either case, the gas company, upon request, will send an engineer to look the situation over and explain what to do in case of an alarm. The company will advise on how to turn the service on again, which may be an intricate procedure because of the many pilot lights, etc.



FLOW-COLD* LIQUID CHILLERS

Self-contained, compact and efficient Units, furnished completely wired and with refrigerant piping completed at the Factory. For Industrial applications or for Residential uses, ACME FLOW-COLD Units are simple and easy to install and will give lowest cost, most efficient cooling. Can be used for Heat Pump application where a suitable heat source is available.

In selecting the most efficient equipment to perform a specific job of refrigeration, your task is greatly simplified when you specify "ACME" — for the ACME line is complete enough to give you a suitable ACME Product, for every kind of Residential or Industrial chilling or liquid cooling requirement. And you are certain of getting the most practical, maintenance-free, low cost operation, for ACME equipment has been preferred in the heavy Refrigeration Industry for more than 30 years.

ACME DRY-EX* CHILLERS

For brine, alcohol, water or any low viscosity fluids. There are more than 700 combinations of refrigerant heads, baffle spacings and tube lengths. The most efficient direct expansion, shell and tube units offered to the Refrigeration Industry in the last 10 years.

Acme products

tailored to fit every kind of LIQUID CHILLING or WATER COOLING JOB

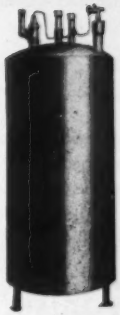
ACME ALSO MANUFACTURES: EVAPORATIVE CONDENSERS • FREON CONDENSERS • AMMONIA CONDENSERS • SHELL AND COIL CONDENSERS • SHELL AND TUBE CONDENSERS • FIN COILS • PIPE COILS • COOLING TOWERS • OIL SEPARATORS • LIQUID RECEIVERS • HEAT EXCHANGERS

UXR DRY-EX* WATER CHILLERS

For smaller loads, ACME has available the UX and the UXR type DRY-EX models, with both fixed and removable tube bundles. For applications involving brine, glycols, liquid sub-cooling or inter-stage condensing, consult factory for additional information and recommendations.

HI-PEAK* WATER CHILLERS

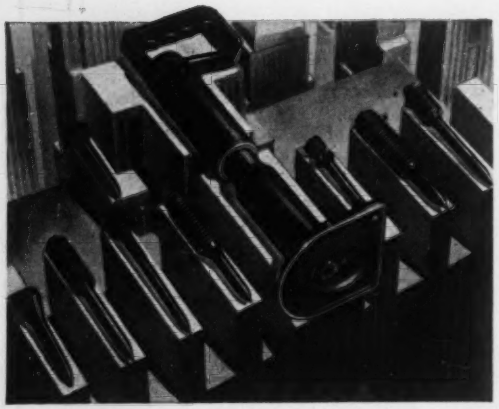
Are offered in seven standard sizes, for intermittent or continuous operation. HI-PEAK Water Coolers have large storage capacity and are galvanized after fabrication. Factory Insulation optional. Equally efficient for use with Freon or Ammonia, require a separate Compressor, as it is not a self-contained cooling unit.



ACME PRODUCTS

Acme INDUSTRIES, INC. JACKSON, MICH. U.S.A.

CONTINUOUSLY SERVING THE REFRIGERATION INDUSTRY SINCE 1919



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FOR FASTER, *SURE* FASTENING

You'll save more time, more money, more man power, obtain more complete satisfaction with RAMSET® FASTENING SYSTEM. That's because it is the *only integrated method* of powder-actuated fastening:

- **Choice of light-duty or heavy-duty tool, with matching lines of alloy steel fasteners and accurately graded power charges; all closely fitted to your specific work.**
- **Applicable to widest range of fastening work, with special accessories to do jobs not possible with other methods.**
- **Nationwide network of competent dealers for local service and application suggestions, plus factory field engineers for difficult problems.**

Most widely used and enthusiastically accepted for fastening almost anything into steel, concrete, other suitable materials.

Written evidence from our thousands of users proves these statements. For the fastest, surest, most accurate powder-actuated fastening, insist on genuine RAMSET SYSTEM. Write or wire for details and name of your local RAMSET Dealer, or use handy coupon below.

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This 74 page paper bound book is available from the association for $1.00.

Handbook Covers District Heating

The District Heating Handbook, Third Edition, comprising a manual of district heating practice, a description of the district heating industry and a guide to modern commercial equipment, has been published by the National District Heating Association, 827 N. Euclid Ave., Pittsburgh 6. Since the second edition was published, there has been much progress made in all phases of the industry. The new edition has been completely rewritten, with material drawn from various papers and reports in the association's publications, and from the files of many operating companies.

Early chapters describe the growth and present status of the industry, and the economics of district heating. District heating plants are discussed (including operating methods and data) and general information is given on building heat transfer calculations, heat transfer from pipes etc.

Other chapters cover water chemistry and corrosion (causes and prevention of scales and sludges, etc.); steam distribution (underground insulation specifications, steam-flow formulas, piping, valves, fittings and accessories, etc.); metering; building heating systems (gravity steam and vacuum steam systems, pipe sizes for steam heating systems, etc.); consumers' process and accessory equipment (steam water heaters, condensate recovery systems, etc.); estimating steam requirements (for space heating and processes); economical use of steam; rates (rate schedules and comparisons); sales activities for the industry; and the use of hot water for district heating.

The last section contains an index to advertisers, a product directory, and a 71 page advertising section with illustrations, descriptions and specifications for a wide variety of commercial products frequently used in district heating.

The 529 page book may be obtained from the association. The price is $7.00.

Effectiveness of Electrostatic Air Cleaner Tested

The Bacterial Filtration Efficiency of an Electrostatic Air Cleaner, a paper by O. M. Lidwell which appeared in the June, 1951, issue of the Journal of the Institution of Heating and Ventilating Engineers, presents results of a series of measurements which were made of the effectiveness of an electrostatic air cleaner in removing airborne bacteria from the air passing through it. Naturally occurring dust-borne organisms, sprayed cultures and prepared spore suspensions were used in the tests. Removal from the air of more than 99 percent of bacteria carrying particles of these types was found to be relatively easy (while maintaining a reasonable rate of air flow through the cleaner). Removal in excess of 99.9 percent was obtained only with the spore suspension.

The IHVE Journal is published by the Institution, 75 Eaton Place, London S.W.1, England.

Problems of Plant Maintenance Discussed

Techniques of Plant Maintenance — 1951, a volume consisting of the proceedings of the conference on plant

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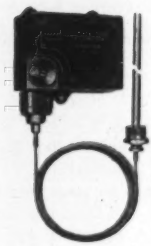
COOLING *Systems*



REMOTE BULB THERMOSTAT

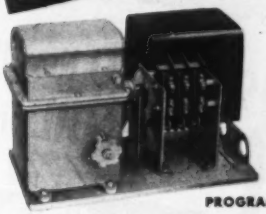
SINGLE-STAGE
- ✓ ROOM THERMOSTAT
- ✓ REMOTE BULB THERMOSTAT

TWO-STAGE
- ✓ TWO-STAGE ROOM THERMOSTAT
- ✓ TWO-STAGE REMOTE BULB THERMOSTAT

MULTIPLE-STAGE
- ✓ PROGRAM SWITCHES

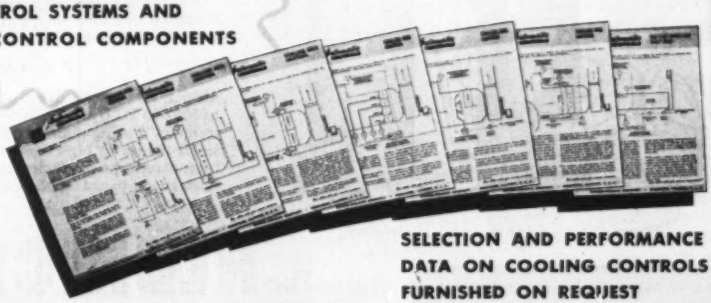
SINGLE-STAGE ROOM THERMOSTAT

TWO-STAGE ROOM THERMOSTAT



PROGRAM SWITCH

COMPETENT FACTORY-TRAINED FIELD ENGINEERS ARE AVAILABLE FOR ASSISTANCE IN THE DESIGN OF COOLING CONTROL SYSTEMS AND THE SELECTION OF CONTROL COMPONENTS



SELECTION AND PERFORMANCE DATA ON COOLING CONTROLS FURNISHED ON REQUEST

BARBER COLMAN

BARBER-COLMAN COMPANY

1228 ROCK STREET • ROCKFORD, ILLINOIS

maintenance held concurrently with the plant maintenance show in January, 1951, has been published by Clapp & Poliak, Inc., the management of the show. Chapters in the book correspond to the meeting sessions and cover electrical equipment, power plant and heating equipment, small plants, lighting equipment, chemical plants, paper and paper products plants, food processing plants, metal working plants, and applied lubrication. Included in the volume at the end of each chapter are questions which were put to the speakers and the answers given.

In the chapter on power plant and heating equipment maintenance, boiler design, boiler water treatment, firing equipment and automatic combustion control equipment are covered. Methods for coping with pipe corrosion and other piping problems are discussed in various chapters dealing with specific industries.

Those who registered at the conference will receive this 228 page book without charge. Others may obtain it from the publishers, 341 Madison Ave., New York 17, at $6.00 a copy.

Methods Outlined for Measuring Low Air Speeds by the Use of Titanium Tetrachloride

Research report number 25, The Measurement of Low Air Speeds by the Use of Titanium Tetrachloride, published by the Texas Engineering Station, The Texas A. and M. College System, College Station, Texas, discusses the use of titanium tetrachloride smoke for calibrating anemometers at low air speeds.

During the course of a recent investigation the writers, Elmer G. Smith, Bob H. Reed, and H. Darwin Hodges, became aware of the need for a rapid and reasonably accurate method for calibrating anemometers, especially at speeds lower than 100 ft per minute. They discovered that the characteristics of titanium tetrachloride smoke enabled observers to clock air speeds as well as to observe the uniformity.

The 22 page report describes and illustrates the six different methods which were developed to aid in this calibration. Two can be used to calibrate the lower part of the range of a paddle wheel anemometer. Two others can be used for the lowest ranges of a deflecting vane type of anemometer, a hot wire anemometer, or a heated thermocouple anemometer.

The report can be obtained from the experiment station.

New Standards Issued for Multiple V-Belt Drives

The Rubber Manufacturers Association, Inc., 444 Madison Ave., New York 22, and the Multiple V-Belt Drive & Mechanical Power Transmission Association, 7 W. Madison St., Chicago 2, have issued a 16 page manual, Engineering Standards for Multiple V-Belt Drives, containing recommendations developed and approved by the technical committees of both associations. The manual is intended to indicate, as nearly as possible, the proper sheaves and belts for the attainment of optimum efficiency and economy of the complete drive in relation to the particular duty required.

The standards cover multiple v belt drives, v belt sheaves and v belts which are used primarily for industrial purposes. Tables give groove dimensions for v belt sheaves, standard keyseats, prime mover characteristics

9 out of 10 New Homes
Heat with OIL or GAS
You Sell BOTH Markets
with ALDRICH
HEAT-PAK BOILER-BURNERS
Expand your market to 90% of new home construction with Aldrich. Sell more, with less inventory . . . cash in with oil units, cash in again with gas burners.
Mounting plates are similar; installation is fast and simple. And you can convert from one fuel to another without changing boiler set-up or performance.
7 makes 14
Aldrich Heat-Pak boilers come in 7 sizes, from 100,000 to 808,000 BTU/hr. With both oil and gas, you have 14 compact heating plants to sell everything from modern small homes to big commercial installations. Vertical-type, compact and efficient; shipped crated fully assembled, ready to set in place and connect.
Available Oil-Fired
Available Gas-Fired
Burners Interchangeable
Profit with ALDRICH—Get Details Today. Write or wire for Heat-Pak facts, full specifications.
ALDRICH HEAT-PAK PRODUCTS
The ALDRICH Company
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and their relationship to service factor, suggested service factors, hp ratings for "A," "B," "C," "D," and "E" section v belts, etc.

The manual may be obtained from either association at $1.00 for two copies.

AGA Bulletins Discuss Combustion of Industrial Gases

The committee on industrial and commercial gas research of the American Gas Association, 420 Lexington Ave., New York 17, has issued two reports which are intended to furnish the foundation for new approaches to the burning of industrial gas.

Advanced Studies in the Combustion of Industrial Gases — Part II is the second report issued on methods of increasing the number of Btu's from industrial gas in a given space and time. Part I presented some experimental views of the application of the principle of detonation to industrial gas burning. Part II, by Dr. John J. Turin, University of Toledo, and Jack Huebler, Surface Combustion Corp., Toledo, further attempts to develop these theories which would apply to industrial gas when fed at continuous rates. Observations and experimental reactions testing the theories are included.

Gas-Air-Oxygen Combustion Studies investigates the use of oxygenated air for many high temperature industrial heating operations. This use has become possible with the advent of lower cost oxygen of commercial purity. Combustion characteristics, temperatures attainable, burning velocities and similar phases of the problem are covered.

The reports may be obtained from the association.

Urges Use of Multi-Fuel Burners in Industrial Plants

Users of industrial steam generating equipment were urged to use multi-fuel burners as a means of achieving maximum economy and flexibility of operation in the face of uncertainties of fuel costs and availability caused by the national emergency. This recommendation was made at the recent spring meeting of the American Society of Mechanical Engineers, 29 W. 39th St., New York 18, by William H. Decker, assistant chief combustion engineer, Sinclair Refining Co.

In his opinion, the savings effected by switching fuels to take advantage of favorable prices more than pay for multi-fuel burners. However, he admitted that there are a few instances where, due to special considerations, the extra cost of a multi-fuel burner would not be justified. As an example he cited the Gulf Coast area where natural gas is cheap and abundant.

In addition to the use of the cheapest fuel from a purchased cost standpoint, Mr. Decker pointed out that the consumer should take into consideration the handling and preparation costs of any one fuel in order to determine the least costly fuel on an "as fired" basis. He also stressed the fact that these burners permit successful burning of a number of waste or by-product fuels which are often produced in manufacturing processes. Among such fuels are petroleum pitch, petroleum coke, asphalt, tar, acid sludge, coke oven gas, refinery or natural dump gases. "The utilization of these waste fuels can be quite desirable provided that handling or preparation costs are not too

Set Studs into Steel or Concrete in seconds

← DIRECT TO CONCRETE

with the VELOCITY-POWER DRIVER

Better 3 Ways!

1. IT'S SIMPLE

One-handed operation. Load—position—fire. Stud imbedded—job done. Two basic parts—barrel and firing unit—easy to service. Integral cartridge bans matching and fitting—ready to use.

2. IT'S VERSATILE

Drives studs easily into steel or concrete. Interchangeable barrels permit driving of either ¼ or ⅜-in. studs from same firing unit. Wide range of studs available—solid head, internal or external threaded types.

3. IT'S SAFE

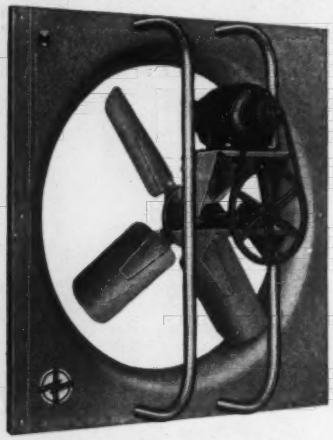
Center-fire cartridges plus spring-loaded safety arm that must be rotated 180 degress and held before stud can be fired makes accidental discharge impossible. Barrel design and long bearing area of piston avoids ricochet, flash, recoil. Cartridge assemblies assure right load for the job. Write for Bulletin No. TA-17.

DEALERS WANTED—Big, profitable sales opportunity in a broad market with this time, labor and money saving tool for maintenance, repair and construction work. Cartridge-studs bring repeat business. Act now!

VELOCITY POWER TOOL COMPANY

7505 Thomas Boulevard
Pittsburgh 8, Pa.

Remove Dusty and Humid Air with Peerless Electric INDUSTRIAL EXHAUST FANS



PEERLESS ELECTRIC PVB exhaust fans are widely used in factories, warehouses, foundries, etc., and may also be installed in ducts where low static pressure resistance is encountered. Because of complete ball bearing construction, the fans may be mounted in either vertical or horizontal positions.

FIVE FAN SIZES

The fans are made in 24", 30", 36", 42" and 48" diameters. Self-aligning ball-bearing pillow blocks provide rigid support. Bearings are pre-lubricated and equipped with labyrinth steel seals to retain the lubricant and to exclude dust and moisture.

MOTORS

The motors range from ¼ to 1½ H. P., single-phase Capacitor-Induction and three-phase Induction types, are equipped with ball bearings and are totally enclosed, rigid mounted, and operate at 1750 RPM on 60-cycle current. Motors with other characteristics also available.

AUTOMATIC WALL SHUTTERS

Automatic wall shutters of same sizes as fan diameters also are available.

Write for complete specifications on Peerless Electric PVB Industrial Exhaust Fans and Automatic Wall Shutters.

THE PEERLESS ELECTRIC COMPANY
Established 1893 • *WARREN, OHIO*

Peerless Electric
MOTORS • FANS • BLOWERS

great," Mr. Decker said. In his opinion, the successful burning of waste fuels evolves around the ability of the installed units to automatically compensate for changing fuel quantities without upsetting either steam, power production, or both with a minimum of operating attention.

In speaking of the design of a multi-fuel burner, Mr. Decker warned that the burner should be designed to furnish enough primary air to maintain both stable and rapid ignition, with the secondary air added under conditions of good mixing and turbulence beyond the zone of ignition. He said that, in general, the combustion of a solid fuel is more difficult, and a burner designed with sufficient turbulence and mixing for this fuel will usually be satisfactory for liquid or gaseous fuels.

New Procedure Data Contained in Arc Welding Textbook

Welding lessons which form the basis of courses given in the arc welding school of Lincoln Electric Co. comprise the first half of the book, New Lessons in Arc Welding (320 pages), published by the company. About half of these lessons represent the more elementary course, covering the welding of mild steel in all positions. The remaining advanced lessons give information on how to weld alloys, sheet metal and pipe. Practice materials, exercises, questions and answers are given for each lesson.

A welding application supplement forming the second half of this book is designed to increase the knowledge and skill of welding operators and students who already have mastered a basic course of instruction. Part I of the supplement, "How to Lower Welding Costs," explains latest procedures for faster, lower cost welding and covers automatic and semi-automatic submerged arc welding. Section II, "How to be a Better Welder," covers metal identification, weldability, stress relieving and joint design. Section III, "How to Design for Welding," stresses methods for making machinery with welded steel.

The book may be ordered through regular book dealers, from any representative of The Lincoln Electric Co., or direct from the company at Cleveland 17, Ohio. The price is $1.00 (postpaid) in the U. S., $1.50 elsewhere.

Los Angeles Air Pollution Reduced by 35 Percent, Says Report

Since April 1948, the pollution in the air of Los Angeles County has been reduced by approximately 35 percent, according to the 1949-1950 Technical and Administrative Report on Air Pollution Control in Los Angeles County, which says this figure is substantiated by available records showing the amount of contaminants already removed and by data obtained from measurements of the atmosphere.

Published by the Air Pollution Control District of the County of Los Angeles, the report indicates that to date, 1773 permits have been approved by its engineering division, 1207 of which have been for newly installed basic equipment. The remaining 566 permits have been issued for control devices on equipment which uncontrolled would violate the regulations. More than 6000 sources that formerly admitted pollutants in excess of amounts permitted by law have been corrected.

The figure of 35 percent is based on weights of material and assumes that no differences exist in the relative im-

portance of each contaminant in the overall pollution. A continuous monthly record was maintained for those factors affecting visibility. Based on daily measurements and on the daily visibility cycles, as measured by the United States Weather Bureau, the improvement in visibility is said to be at least 30 percent. In the absence of complete knowledge on the importance of each type of pollutant, the correlation between the quantities removed and the visibility improvement is said to be the best measure of overall progress.

The report continues by stating that other information, though less tangible, adds further evidence to support the improvement. For example, air concentrations of sulphur dioxide and sulphur trioxide have been reduced by 50 percent. No crop damage from sulphur dioxide in local areas has been reported during the year. General and specific complaints are described as decreasing, and local nuisance problems are at a minimum.

The District's research division identifies all pollutants in the atmosphere and determines their effects under the peculiar set of weather conditions existent in the Los Angeles basin. Responsibility for obtaining information for this identification work is divided throughout the organization. The inspection division locates the sources, the engineering division secures data to determine the total emissions going into the atmosphere, and the research division collects samples from the atmosphere for identification. The report is subdivided so as to cover the work of the various divisions, and tables and charts are used to indicate progress made.

It is interesting to note that during the fiscal year of 1949-1950, the dollar value of basic equipment approved by the engineering division was $12,784,400. The corresponding value of pollution control equipment approved was $2,158,200.

Other Books and Reports Received

GALVANIZING (HOT-DIP)—The third edition of this text by Heinz Bablik, lecturer at the Technical University, Vienna, has been published by John Wiley & Sons, Inc., 440 4th Ave., New York 16. The book discusses the structure and composition of scale resulting from surface oxidation, and covers the pickling theory of scale removal. After the nature and use of fluxes are described, galvanizing — both theory and practice — is covered, the new edition having been revised to include the latest methods. Dr. Bablik has extended his discussions of iron-zinc reaction and fusion-reaction and has included illustrations showing the structure of the scale and zinc layers.

This 502 page book is available from the publisher at $10.00 a copy.

MOLESWORTH'S HANDBOOK OF ENGINEERING FORMULAE AND DATA—The 34th edition of this handbook, completely revised and reset, has been published by E. & F. N. Spon Ltd., London, and imported by The Macmillan Co., 60 5th Ave., New York 11. This edition was edited by Albert Peter Thurston, former president of The Newcomen Society. It contains an introductory general section covering standard units and conversion factors, mathematical tables, etc., and separate sections for civil and general engineering, mechanical engineering and electrical engineering.

The 1672 page handbook may be obtained from The Macmillan Co., at $6.50 a copy.

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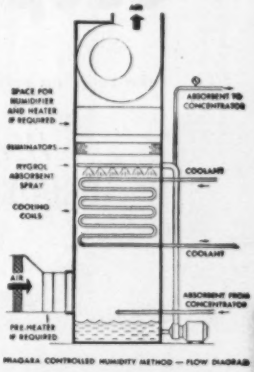
Because it absorbs moisture from the air directly, the new Niagara Controlled Humidity Method uses less, or no, mechanical refrigeration for dehumidifying. You save first costs and installing of heavy machinery. You save space, maintenance expense, power. Easier, convenient operation.



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Using "Hygrol" hygienic absorbent liquid, this method gives complete control of temperature and relative humidity. Especially, it is a better way to obtain dry air for drying processes, packaging hygroscopic materials, preventing moisture damage to metals, and obtaining better quality for chemical process products and food products—or in obtaining better results in comfort air conditioning for office or laboratory at lower refrigeration costs.

The diagram shows how filtered air is dehumidified by passing thru a spray of "Hygrol"— a liquid absorbent which removes air-borne moisture. This liquid is hygienic and non-corrosive; it contains no salts or solids to precipitate and cause maintenance troubles. It is continuously reconcentrated at the same rate at which it absorbs moisture, providing always the full capacity of the air conditioner, automatically.

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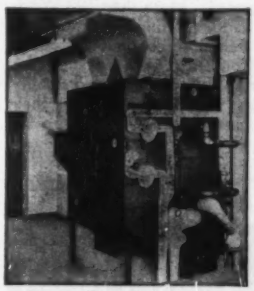
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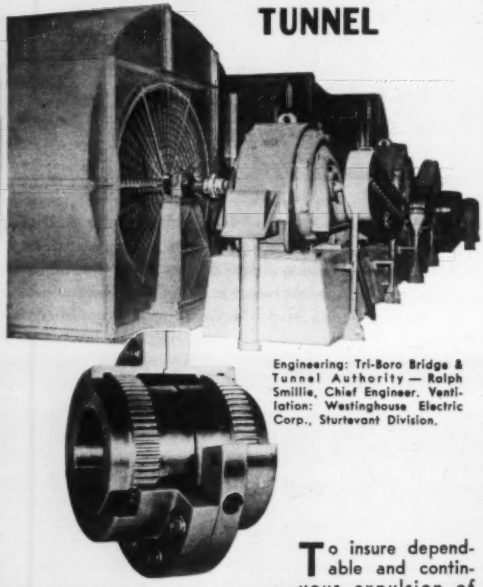

Engineering: Tri-Boro Bridge & Tunnel Authority — Ralph Smillie, Chief Engineer. Ventilation: Westinghouse Electric Corp., Sturtevant Division.

To insure dependable and continuous expulsion of deadly exhaust gases in America's longest vehicular tunnel required the best in engineering skill, ventilating apparatus and power driving equipment. More than 100 Westinghouse motors drive the huge Westinghouse fans and to secure the maximum assurance of continuous trouble-free service WALDRON Couplings were selected for each drive. No finer testimonial to the all-round quality of the WALDRON Coupling could be had than their selection for this notable engineering project. Write for Catalog No. 57.

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MEETINGS & CONVENTIONS

IBR SCHOOL OF MODERN HEATING—The school of modern heating, sponsored by the Institute of Boiler and Radiator Manufacturers, 60 E. 42nd St., New York 17, is a travelling school designed to provide an intensive three-day training in heating design and installation. Classes will be held this month from August 14 to 16, at New Haven, Conn., and August 21 to 23, at Springfield, Mass. A list of the dates and locations of meetings to be held through December of this year is now available from the institute.

OAK RIDGE NATIONAL LABORATORY AND OAK RIDGE INSTITUTE OF NUCLEAR STUDIES—The third annual symposium sponsored by these organizations will be held at Oak Ridge, August 27 to September 7, and will take as its theme, "engineering in nuclear energy development." Sessions are open to all professional engineers. For details, write University Relations Division, Oak Ridge Institute of Nuclear Studies, P.O. Box 117, Oak Ridge, Tenn.

EIGHTH INTERNATIONAL CONGRESS OF REFRIGERATION—to be held in London, England, August 29 to September 11, under the auspices of The International Institute of Refrigeration. Accommodation for the meetings will be provided at Church House, Westminster. Additional information may be obtained from the secretary of the conference, Dalmeny House, Monument St., London, E. C. 3.

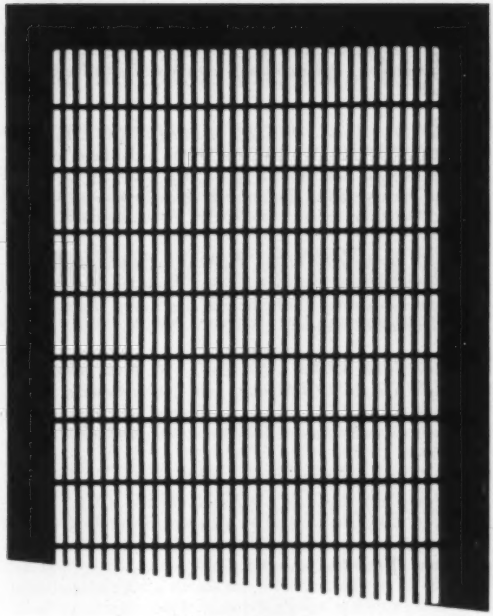
6th NATIONAL INSTRUMENT CONFERENCE AND EXHIBIT—Sponsored by the Instrument Society of America, 921 Ridge Ave., Pittsburgh 12. The affair will be held in the Sam Houston Coliseum, Houston, Tex., September 10 to 14.

INTERNATIONAL DISCUSSION OF HEAT TRANSFER—Postwar heat transfer developments will be the theme of a meeting, September 11 to 13, London, England. Plans for participation by engineers in the western hemisphere are being arranged by a joint committee on North American participation, which consists of representatives from some 12 professional and engineering societies. The American Society of Mechanical Engineers is coordinating administrative details.

BRITISH BUILDING RESEARCH CONGRESS—Sponsored by a number of professional institutions and societies, government departments, and representative industrial federations, the congress will be held in London, September 11 to 20. Additional information may be obtained from the organizing secretary, Building Research Congress 1951, Building Research Station, Bucknalls Lane, Garston, Watford, Herts, England.

Among the papers to be presented during the heating and ventilating sessions is one on heat transfer, by Prof. C. O. Mackey, Cornell University, and one on radiant heating by Prof. F. W. Hutchinson, University of California.

1951 PUBLIC WORKS CONGRESS AND EQUIPMENT SHOW—The congress and show, sponsored by the Ameri-



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Hendrick Grilles are fabricated in accurate sizes, with clean-cut perforations and with no burrs or other imperfections; are easy to install; and always lie flat because of a special flattening operation in their manufacture.

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Typical Industries in which Transite Industrial Vent Pipe is used:

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Bleaching	Gas	Rayon
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Canning	Laundry	Shipbuilding
Ceramic	Leather	Shoe
Chemical	Match	Smelting
Dairy	Meat Packing	Soap
Drug	Metal	Soft Drink
Electrical	Mining	Sugar Refining
Explosives	Paint	Textile
Farm Machinery	Petroleum	Tool
Food	Potash	Water & Sewage

Johns-Manville TRANSITE Industrial Vent PIPE

can Public Works Association, 1313 E. 60th St., Chicago 37, will be held September 16 to 19 at Veterans Memorial Bldg., Detroit, Mich.

39th NATIONAL SAFETY CONGRESS AND EXPOSITION—to be held in Chicago, October 8 to 12. Sessions on industrial safety are scheduled for the Stevens, Palmer House, Congress and Morrison hotels. For further information write R. L. Forney, general secretary, National Safety Council, 425 N. Michigan Ave., Chicago 11.

AMERICAN GAS ASSOCIATION, 420 Lexington Ave., New York City—The 33rd annual convention, St. Louis, October 15 to 17. The Jefferson hotel will be headquarters for the residential gas and industrial and commercial gas sections; the Mayfair and Lennox hotels for the operating section; and the Statler hotel will house the accounting section.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS, 919 Milam Bldg., Houston 2, Tex.—The annual meeting of the association's South Central Region is scheduled for October 18 to 20, at Corpus Christi, Tex.

PLUMBING AND HEATING INDUSTRIES BUREAU—The annual meeting will be held at the Palmer House, Chicago, October 25.

CONFERENCE ON DESIGN AND CONSTRUCTION OF ATOMIC INSTALLATIONS—Co-sponsored by the American Institute of Architects and the U. S. Atomic Energy Commission, this conference will be held in October, in Washington, D.C. It will be conducted by the Building Research Advisory Board of the National Research Council. Discussions of atomic age architecture are planned.

THE 7th ALL-INDUSTRY REFRIGERATION AND AIR CONDITIONING EXPOSITION, to be held at Navy Pier, Chicago, November 5 to 8. The affair is sponsored by the Refrigeration Equipment Manufacturers Association, 1346 Connecticut Ave., N.W., Washington 6, D. C.

NATIONAL HEATING WHOLESALERS ASSOCIATION, 609 Union Commerce Bldg., Cleveland 14, Ohio—The annual meeting will be held at the Statler Hotel, Cleveland, December 3 and 4.

NATIONAL WARM AIR HEATING AND AIR CONDITIONING ASSOCIATION, 145 Public Square, Cleveland 14—The 1951 annual convention is scheduled for December 5 and 6, and will be held at the Hotel Cleveland, Cleveland.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS—The 58th annual meeting will be held in St. Louis, January 28 to 30. The next International Heating, Ventilating and Air Conditioning Exposition will be held in conjunction with the society's 59th annual meeting, to be held in Chicago, January, 1953.

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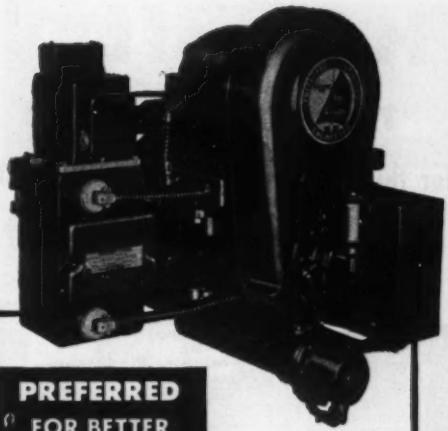

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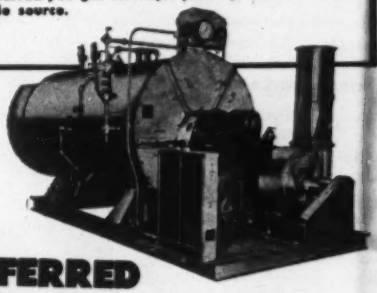

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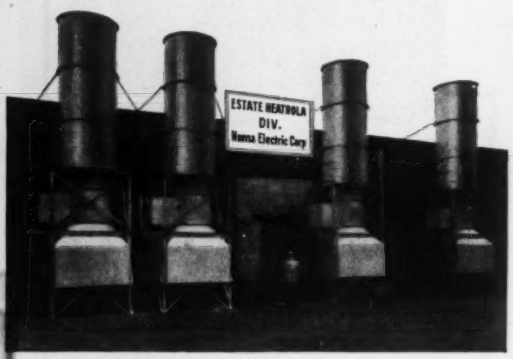

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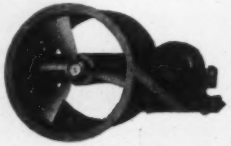
Propellair Tubeaxial Fans (Model CS-48P) with protective coating on parts exposed to air stream were selected for this exacting job. Each of the four fans delivers 40,000 C. F. M. at the system resistance of ⅜" static pressure. Flexibility and economy are achieved with only 40 H. P. compared to 100 H. P. for a central system and centrifugal fan. Rugged Propellair design assures trouble-free performance under adverse atmospheric conditions and round-the-clock operation.

Propellair has a fan for almost every industrial ventilation problem. Qualified sales engineers are available for consultation without obligation.



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Alloy Forms for Brazing

HPAC 101—A new four page folder issued by Handy & Harman, 82 Fulton St., New York 7, illustrates typical applications of the company's rings and other preformed shapes of low temperature silver brazing alloy which are "preplaced" at joints for brazing with a fast heating method. Available as round and square wire in various sizes, as flat strip and sheet in various gages and as filings and powder, the alloy also can be formed to specifications.

Aluminum and Aluminum Products

HPAC 102—A new 45 page booklet issued by Reynolds Metals Co., Louisville 1, Ky., describes the growth and present facilities of the company and the characteristics and applications of its aluminum products, which are used as insulating roofing and siding for industrial and commercial buildings, as rods, bars and wires for structural applications, etc.

Atomic Defense for Industrial Plants

HPAC 103—"How to Prepare Your Plant for Atomic Attack," a new booklet issued by Walter Kidde & Co., 675 Main St., Belleville 9, N.J., presents facts about the atomic bomb, its destructive potential and personnel organization for coping with possible disaster. Also covered are the various types of portable fire fighting equipment suitable for different classes of fires.

Bending of Aluminum Sheet

HPAC 104—An 11 x 17 in. chart giving recommended minimum radii for the proper cold bending of aluminum sheet in various gages of the most commonly used alloys has been published by Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, Calif. Information is given on seven different alloys in six thicknesses, and on utility sheet.

Carbon Brushes

HPAC 105—Booklet GEA-5597, recently issued by General Electric Co., Schenectady, N.Y., covers the company's carbon brushes for electric equipment. The various types of brushes and characteristics of brush grades (specific resistance, apparent density, transverse strength, etc.) are described. Applications of the various grades, recommendations for their specific uses, the mechanical design of the brushes and suggestions for proper brush replacement also are covered.

Circuit Breaker Panelboards

HPAC 106—A new 20 page booklet, B-5260, describing circuit breaker panelboards for the control and protection of lighting, appliances, other power applications and

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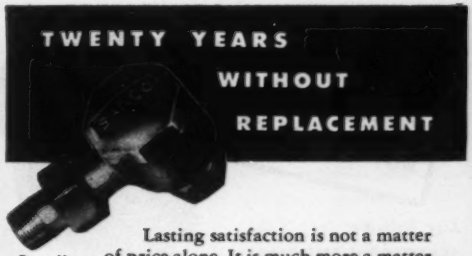

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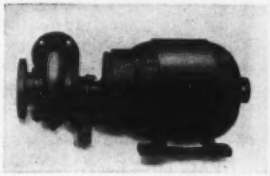

Fig. 3650 Close-Cupld Centrifugal

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A satisfied customer is always the best salesman for air conditioning. And it always pleases the customer when his unit operates almost without sound.

Goulds compact Close-Cupld pumps are carefully engineered for the least vibration and noise possible. Wear-resisting parts, balanced design, and careful workmanship give carefree service—for years. It will pay you dividends to investigate the Goulds Close-Cupld pump for air conditioning applications. For larger jobs Goulds Double-Suction Centrifugals are equally dependable.

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Low Velocity Range: 0-750 fpm
High Velocity Range: 750-4000 fpm
Pressure Range: 0-4 inches water

Based on the hot thermopile principle, the AGITAIR Meter gives instantaneous accurate measurements of air velocities as low as 5 fpm, and as high as 4000 fpm. It is inherently stable, does not waver or jerk and unlike many resistance type hot-wire instruments it is free from errors caused by temperature variations, radiation effects and lead resistance. For taking static pressure readings from 0 to 4" wg, a special attachment is provided. The simplicity and utility of the AGITAIR Meter make it useful for many diverse applications.

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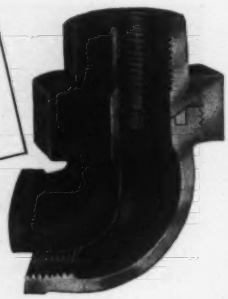

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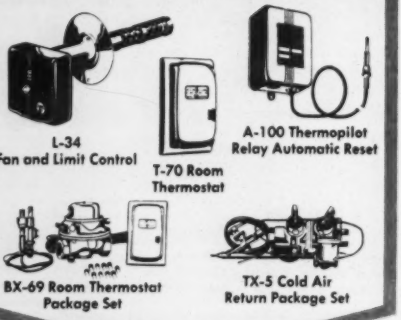

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801 ALLEN AVENUE GLENDALE 1, CALIFORNIA

Manufacturers of Automatic Pressure, Temperature, Level and Flow Controls
FACTORY BRANCHES: Baltimore 5, Birmingham 3, Boston 16, Buffalo 3, Chicago 5, Cincinnati 2, Cleveland 15, Dallas 2, Denver 4, Detroit 21, Glendale 1, Houston 6, Indianapolis 4, Kansas City 2, Minneapolis 2, Newark 6, New York 17, Philadelphia 23, Pittsburgh 22, St. Louis 3, San Francisco 7, Seattle 1, Tulsa 6, Washington 6.
DISTRIBUTORS IN PRINCIPAL CITIES

the circuits that supply them is available from Westinghouse Electric Corp., Box 2099, Pittsburgh 30. The company's "De-ion" industrial and commercial circuit breakers in capacities from 10 to 600 amp are covered.

Dehumidifier Units

HPAC 107—Abbeon Supply Co., 179-15 Jamaica Ave., Jamaica, N.Y., has issued a new edition of its bulletin, "A Few Facts About Dehumidification For Industry." There is a general discussion of relative humidity and how it is computed. The results of too much humidity are outlined, and a table of recommended humidities in various industries is given. Two models of the company's refrigeration type dehumidifier units are described and illustrated.

Diaphragm Motor Valves

HPAC 108—The series 362 air operated diaphragm motor valves for use with narrow throttling bands or on-off instruments are described in specification sheet 415-1, prepared by the manufacturer, Minneapolis-Honeywell Regulator Co., Brown Instruments Div., Station 40, Wayne and Windrim Aves., Philadelphia 44. The sheet gives data on sizes, construction, body materials, connections, etc., in tables and drawings. Pressure drop ratings are included.

Draft and Low Pressure Instruments

HPAC 109—Bulletin 51-667 covering its line of draft and low pressure instruments has been issued by The Hays Corp., Michigan City, Ind. It describes indicators (seven types), recorders and controllers. A two page application table is included to aid in the selection of the correct instrument for specific conditions. Features such as calibrating springs and diaphragm units are explained and the size, scales, ranges, cases, etc., of each instrument are illustrated and discussed. In addition, 14 types of draft and pressure, differential and other measuring elements are illustrated.

Fire Resistant Cabinets for Drawings

HPAC 110—Remington Rand Inc., 315 4th Ave., New York 10, has issued a new brochure, SC 688, which describes its fire resistant insulated cabinets, files and indexes for storing tracings, drawings, etc. Dimensions are given for various models, and some fire and impact test results are described.

Fittings Machine

HPAC 111—The Cleveland Tapping Machine Co., subsidiary of Automatic Steel Products, Inc., Canton 6, O., has developed a new machine for the pipe and conduit fittings industries. Three models, F-1, F-2, and FT-1, are illustrated and described in Bulletin F-100, recently issued by the company. The first two models do two 90 deg ells, street ells or reducer ells at each stroke of the machine, threading and chamfering simultaneously from the cored hole. The third taps and chamfers two tees at each stroke. General specifications are given and typical applications are shown.

Heating Costs

HPAC 112—A new 24 page booklet, "179 Ways to Cut Your Heating Costs," issued by The Heil Co., Milwaukee 1, gives pointers on how to get maximum performance

MINERALLAC
Perforated
STRAP
Versatile Hanger Iron

Safely supports hanging pipes, conduits and cables up to 500 lbs. Made of ¾-in. 18 gauge electro-galvanized steel (also available in Everdur, copper, brass or aluminum). Precision made—perforations do not vary. ¼-in. holes on ½-in. centers. Comes in 10-ft. coils and 5 and 10-ft. straight lengths. Available in other lengths also.

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To determine the best steam trap on which to standardize, a large processing firm recently asked their plant engineers for their preference. In 15 out of 20 plants the choice was Nicholson. The repeated adoption of Nicholson steam traps by plants currently in big "cost-reduction-through-modernization" programs is another indication of their advanced features. To learn why an increasing number of leading plants are standardizing on Nicholson thermostatic steam traps send for our catalog.

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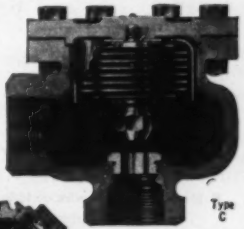

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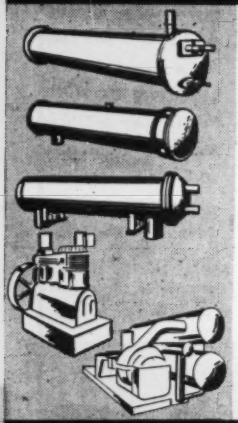

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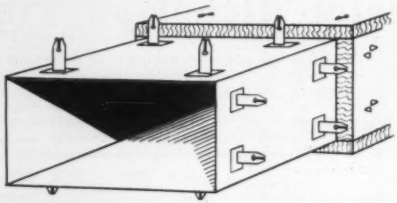

- Stic-Klips become an integral part of Air Duct.
- Stic-Klips hold insulation mechanically in compression.
- Stic-Klips hold insulation firmly and in close contact with air duct.
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- Stic-Klips do a neater job and save labor.
- Stic-Klips are available for practically all types of insulations.

DETAILED INFORMATION IN BULLETIN NO. 2 AVAILABLE ON REQUEST

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50 Regent St. Cambridge 40 Mass.

from heating units and includes information on the proper location of thermostats, thermostat setting under varying conditions, checking the construction details of buildings, etc. Sections are devoted to warm air, steam and hot water heating, and to types of fuel — oil, gas or coal. Requests for booklets should be directed to the company. There is a 10 cent charge.

Heavy Duty Coupling

HPAC 113—An illustrated bulletin prepared by Naylor Pipe Co., 1230 E. 92nd St., Chicago 19, describes the company's heavy duty, wedge lock coupling for use on temporary or permanent pipe lines. Steps for making connections are given (a hammer is the only tool required). Complete specifications are included for a range of light weight pipe sizes from 8 to 30 in. in diameter.

Humidity Recorder-Controller

HPAC 114—A humidity sensing element which operates with the company's potentiometer to provide direct humidity readings from remote locations has been developed by Minneapolis-Honeywell Regulator Co., Brown Instruments Div., Station 40, Wayne and Windrim Aves., Philadelphia 44. Operating principles, general specifications, and typical applications are discussed in a new specification sheet 10.5-4.

Impulse Steam Trap

HPAC 115—Bulletin T-1740 issued by Yarnall-Waring Co., Mermaid Lane, Philadelphia 18, gives operation and construction details for the company's impulse steam traps and describes typical applications. Installation and operating suggestions are given. There is a table covering the thermodynamic properties of saturated steam, and a chart for sizing return lines. The company's flanged traps. integral strainer traps and screwed strainers also are described.

Motors

HPAC 116—The Louis Allis Co., Milwaukee 7, has prepared a special issue of its house organ, the Messenger, to commemorate the company's 50th anniversary. Photographs and text cover changes through the years in plant facilities and in the design of the electric motors produced. Also illustrated are a number of the special and standard types of motors now being made by the company.

Oil Burning Manual

HPAC 117—A four page oil burning manual of information has been prepared by Cleveland Fuel Equipment Co., 7316 Associate Ave., Cleveland 9. Data and formulas are given for operation at 75 percent overall efficiency (natural draft burners), including suggestions about preheating, smoke prevention, etc. Tables give operating data, such as boiler pressure and flue gas temperature. The last page illustrates the company's damper control, applicable to oil, gas or stoker fired boilers.

Oil Fired Heating Equipment

HPAC 118—The Electrol Burner Mfg. Co., 22 Union Ave., Rutherford, N.J., has prepared an eight page booklet discussing the company's progress since its founding in 1918 and describing its burners, water heaters, warm air conditioners, boilers, and other equipment.

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DUAL SWITCH THERMOSTAT

MODEL NWDH for Controlling Air Conditioning Systems!

The Type NWDH dual switch thermostat with remote bulb for duct mounting is being used in applications in which it is desired to handle two electrical circuits from a single thermal assembly. Typical installations include the control of two compressors, one for normal operation and one for peak loads; or a fan and a compressor.

Standard switches are rated at 15 amps 125/250 V. AC. Switches rated at ¾ hp 125 V. AC, 1½ hp 250 V. AC are also available.

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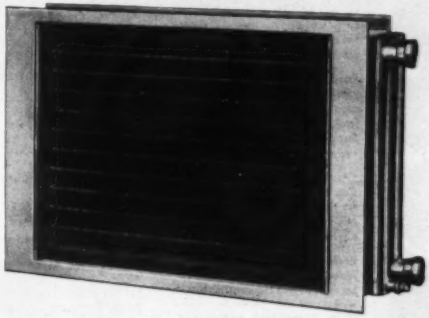
STANDARD & SPECIAL THERMOSTATS & PRESSURE SWITCHES

New REMPE HI-CAP STEAM HEATING COILS with DEFROSTER



For use in combination with air conditioning coils or as tempering and booster units in long heating ducts.

Available in Single Row Type with BTU per hour capacity from 60,000 to 360,000. In Double Row Type, for heavy duty service, in capacities from 129,000 to 775,000 BTU per hour.

Heavy gauge steel casings. Copper Tubes and Headers. Tested 350 lbs. air pressure for steam working pressures up to 125 lbs. Defroster — standard equipment. Also suitable for hot water.

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- *Air Supply*
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Made of any metal, in all standard pipe sizes to 72" and in special fabricated types for round or rectangular ducts; pressure to 100 p.s.i. Flanged or threaded. Manual or automatic controls. Easy to operate and clean. Quick regulating and closing.

Rockwell valves also made in slide types in sizes to 24".

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shipped completely assembled; shipped knocked down

for the 3 to 60 ton jobs

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- **ACCEPTED** as the standard cooling tower of the refrigeration and air conditioning industries!
- **ADAPTABLE,** indoors or out, to fit your space and your cooling requirements!

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DUX-SULATION
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1 High thermal and acoustical insulating properties... K factor of .27 BTU and sound absorption approximately 61%. Integral, woven asbestos membrane.

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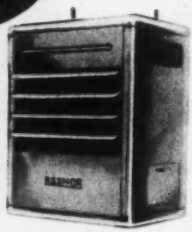

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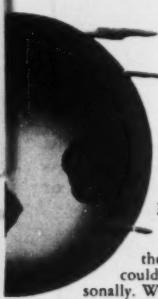

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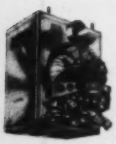

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Plotting of Functions and Independent Variables

HPAC 119—Instrumentation data sheet 10.0-5 describes the new "Electronik" function plotter produced by Minneapolis-Honeywell Regulator Co., Brown Instruments Div., Station 40, Wayne and Windrim Aves., Philadelphia 44. The instrument plots one variable in terms of another and keeps a continuous record of the relationship. Applications are listed (plotting speed versus torque, temperature versus pressure, etc.); and the instrument's characteristics and operating principle are described.

Data sheet 10.0-6 describes the company's duplex recorder which simultaneously plots two totally independent variables on one chart.

Registers and Grilles

HPAC 120—Catalog 18, prepared by Register & Grille Mfg. Co., 70 Berry St., Brooklyn 11, N.Y., illustrates and gives specifications for the company's registers and grilles (lattice grilles, no-vision grilles, floor grilles, single valve registers, etc.). It features new types of performance tables for bar type registers and grilles which show values of throw to 90 ft, are arranged in steps of 10 percent increase or decrease in the length of throw, and give a wide range of aspect ratios for each condition of cfm and throw.

Silicone Sealing Rings

HPAC 121—The "O" rings of Arrowhead Rubber Co., Downey, Calif., are made of inert silicone rubber and are designed to resist many oils, acids, alkalis and chemicals, as well as oxidation. They are said by the manufacturer to resist temperatures of 500 F and above and to be flexible at —130 F. Reference no. F-10, a new manual issued by the company, treats the properties and uses of silicone. A new catalog, 502B, gives data on the rings, including the proper design of equipment on which they are used, designs for simplifying installation, and possible precautions against damaging the seals.

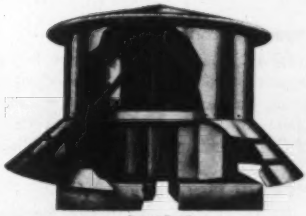
Solder

HPAC 122—Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, has published a 36 page brochure on the nature, properties and uses of solder. Sections are devoted to thermal effects, mechanical properties, principles of soldering, and fluxes. Methods for selecting the proper solder for specific conditions are explained, and fusible alloys are described. Tables give data on the melting range of tin-lead solders, ASTM specifications for soft solder metal, SAE standard solders, federal specifications, and the comparison of wire gages.

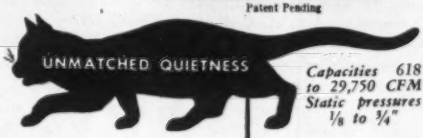
Steam Generating Equipment and Flowable Materials Conveyors

HPAC 123—Bulletin HF 128, an 18 page report issued by Hapman-Dutton Co., Kalamazoo, Mich., describes the company's production facilities, its management and history, and covers products built under World War II contracts. The company's tubular conveyors, steam generators and boiler feed pump systems are illustrated and discussed. Also covered are the large custom products (tanks, boilers, heat exchangers, ductwork, etc.) which are made to specifications.

New
"CHICAGO" GYRA-FLO ROOF EXHAUSTER



Patent Pending



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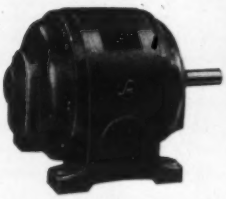

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- Minimum floor space required
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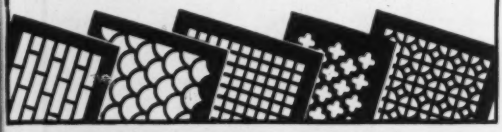

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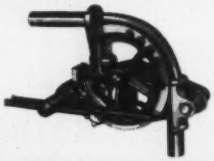
PORTABLE—IN SIZES TO BEND ⅜" O. D. TO 1⅛" O. D.



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AT LEADING SUPPLY HOUSES

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Steam Heating Pumps

HPAC 124—A new 20 page bulletin, no. 1401, gives capacities, ratings, typical specification sheets and installation diagrams for the vacuum pumps (2500 to 65,000 EDR) and condensation pumps (2000 to 50,000 EDR) of C. A. Dunham Co., 400 W. Madison St., Chicago 6.

Steam Trap

HPAC 125—A new 16 page booklet prepared by Velan Engineering Co., 1 Exchange Place, Jersey City, N.J., describes the company's "Universal" steam trap (combining seven different devices) and shows typical installations. The bimetal principle of operation is explained and capacity charts, dimensions, etc., are given for the different models, including the new piston operated trap for handling up to 500,000 lb per hr. Installation instructions are given and the results of various field and laboratory tests also are included.

Temperature Conversion Chart and Thermostats

HPAC 126—A reference chart for use in converting temperatures from —70 to 650 F or C has been issued by Stevens Mfg. Co., Inc., 69 S. Walnut St., Mansfield, O. The reverse side lists the major types of the company's thermostats, their applications and general performance characteristics.

Tubing Steels

HPAC 127—Assistance in solving problems involving the use of alternate grades of low carbon, or carburizing grades of tubing steels, is offered in a new four page bulletin, no. TDC 149, published by The Babcock & Wilcox Tube Co. It presents condensed data on microstructure, forging, thermal treatment, etc., for 14 alloy steels used in the production of tubular parts.

Use of Steam in Industry

HPAC 128—Booklet no. 2171, issued by Sarco Co., Inc., Empire State Bldg., New York 1, gives information on methods for insuring the efficient use of steam in heating and process applications. Topics covered include proper process operating temperatures, the effect of air in steam spaces, condensate removal, recovering waste heat, etc. A few of the company's traps, a regulator, a strainer and an inlet valve are illustrated on the last page.

Ventilators

HPAC 129—A new condensed catalog covering its complete line of ventilators and louvers is now available from The Burt Mfg. Co., 927 S. High St., Akron 11, O. Design and construction features are given for each ventilator type as well as mounting and flashing details and performance, dimension and weight data. Basic information on dampers, bases, industrial louvers and general purpose louvers also is included.

Vibration Fatigue Testers

HPAC 130—All American Tool and Mfg. Co., 1014 W. Fullerton, Chicago 14, is offering a new six page folder describing a number of its vibration fatigue testers for pretesting industrial parts or assemblies. Specifications for standard testing machines are given and a variety of models are described and illustrated.

ROUND OR SQUARE DUCTS . . . it's all the same to FLEXIBLE *Cellufoam.* Fast fitting — Cellufoam is shears cut, covers small curves or square corners—no gapping or bulges. Easy to apply. Over ten years use has proven Cellufoam to be a low cost, efficient duct insulation.

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ESTIMATOR — Plumbing & Heating Contractor located Middle Atlantic States specializing Industrial work requires experienced estimator. Give personal, education, experience data and salary required. Address Key #900-A, Heating, Piping & Air Conditioning, 6 No. Michigan Ave., Chicago 2.

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INDEX TO ADVERTISERS

A-J Mfg. Co. ..... *
Acme Industries, Inc. 183
Aerofin Corp. ..... *
Air Conditioning Products Co. 195
Air Devices, Inc. 195
Air-Maze Corp. ..... *
Airtex Corporation 203
Airtherm Mfg. Co. ..... *
Alco Valve Co. 137
Aldrich Co. 186
Allen-Bradley Co. ..... *
Allis-Chalmers Mfg. Co. ..... 14 & 16
American Air Filter Co. 141-144
American Blower Corp. 35
American Brass Corp., The 18
American Chain & Cable Co., The ..... *
American Radiator & Standard Sanitary Corp. ..... *
American Wheelabrator & Equip. Corp. . 182
Ames Iron Works ..... *
Anderson Co., V. D. ..... *
Anemostat Corp. of America ..... *
Armstrong Cork Co. 13
Armstrong Machine Works ..... *
Atlas Mfg. Co. ..... *
Auer Register Co. 202
Aurora Pump Co. ..... *
Autorad, Inc. ..... *

Babcock & Wilcox Co. ..... *
Badger Manufacturing Co. 174
Baker Refrigeration Corp. ..... *
Barber-Colman Co. 185
Barnes & Jones, Inc. ..... *
Bayley Blower Co. ..... *
Bell & Gossett Co. 17
Binks Mfg. Co. ..... *
Bishop & Babcock Mfg. Co., The ..... *
Black & Decker Mfg. Co. 178
Breidert Co., G. C. ..... *
Brown Products Co. ..... *
Brunner Mfg. Co. 43
Bryant Heater ..... *
Buffalo Forge Co. 29
Buffalo Pumps, Inc. 56
Bullard Co., The ..... *
Bundy Tubing Co. 34
Burnham Corporation ..... *
Bush Mfg. Co. ..... *
Byers Co., A. M. 4

Campbell Heating Co. ..... *
Carrier Corp. ..... facing 144
Cash Co., A. W. ..... *
Century Electric Co. 23
Chase Brass & Copper Co. 160
Chicago Blower Corp. 201
Chicago Pump Co. 54
Clarage Fan Co. ..... Inside Back Cover
Cleaver-Brooks Co. 136
Cleveland Fuel Equipment Co. ..... *
C-O-Two Fire Equipment Co. ..... *
Combustion Engineering—Superheater Inc. ..... *
Committee on Steel Pipe Research of American Iron & Steel Institute 173
Condenser Service & Engineering Co. 198
Connor Engrg. Co., W. B. ..... 11 & 53
Continental Air Filters, Inc. 151
Copeland Refrigeration Corp. ..... *
Crane Co. 27
Crocker-Wheeler Div. Elliott Co. ..... *
Curtis Refrigerating Machine Co. 153
Cyclotherm Corp. 165

Davis Engineering Corp. ..... *
De Bothezat Fans Division American Machine & Metals, Inc. ... 159
De Laval Steam Turbine Co. 138
Delavan Mfg. Co. ..... *
Detroit Lubricator Company ..... *
Detroit Stoker Company ..... *
Dodge Mfg. Co. 19
Dole Refrigerating Co. ..... *
Dole Valve Co., The 45
Dollinger Corp. ..... *
Dravo Corporation 167
Dunham Co., C. A. ..... *
Durant Insulated Pipe Co. ..... *
Dwyer Mfg. Co., F. W. ..... *

Eagan Co., Inc., Walter H. ..... *
Economy Pumps, Inc. ..... *
Emerson Elec. Mfg. Co. 59

Fairbanks Co. ..... *
Farr Co. 7
Fedders-Quigan Corp. ..... *
Fisher Governor Co. ..... *
Fitzgibbons Boiler Co., Inc. ..... *
Fluid Systems ..... 32, 33 & 49
Frick Co. ..... *
Fulton Sylphon Co. ..... *

G. & O. Mfg. Co., The ..... *
Gallaher Co. ..... *
General Controls Co. 196
General Electric Co. 12
Glasfloss Corp., The ..... *
Goulds Pumps, Inc. 195
Governair Corp. 163
Greenlee Tool Co. ..... *
Grinnell Co., Inc. ..... Inside Front Cover
Gustin-Bacon Mfg. Co. 37

Hajoca Corporation ..... *
Hamilton-Thomas Corp. ..... *
Handy & Harman 175
Hapman-Dutton Co. ..... *
Hastings Instrument Co., Inc. ..... *
Hayes Furnace & Mfg. Co., Inc. ..... *
Hays Corp. ..... *
Hendrick Mfg. Co. 191
Henry Valve Co. 52
Hoffman Specialty Co. ..... *
Holsclaw Bros., Inc. 202
Howell Electric Motors Co. 26
Hussey & Co., C. G. 15

Ilg Electric Ventilating Co. ..... *
Illinois Engineering Co. ..... *
Illinois Testing Laboratories, Inc. 172
Independent Register Co. ..... *
Industrial Sound Control Inc. ..... *
Infra Insulation, Inc. 60
Ingersoll-Rand ..... *
Iron Fireman Mfg. Co. 177

Jackson & Church Co. ..... *
Jefferson Union Co., Inc. 196
Jenkins Bros. 156
Johns-Manville ..... 50 & 191
Johnson Co., S. T. ..... *
Johnson Corp. ..... *
Johnson Service Co. ..... *
Joy Mfg. Co. ..... *

Kaylo Div., Owens-Illinois Glass Co. ... *
Keasbey & Mattison Co. 179
Kennard Corp. ..... *
Kennedy Valve Mfg. Co., The 171
Kewanee Boiler Corp. ..... *
Key Co. ..... *
Klipfel Valves, Inc. ..... *
Kritzer Radiant Coils, Inc. ..... *

Ladish Co. ..... *
Lee Corporation, The ..... *
Leslie Co. ..... *
Lincoln Electric Co., The ..... *
Lunkenheimer Co., The 133
Lycoming Spencer Div., Avco Mfg. Corp. 154

Marley Co., The 199
Marlo Coil Co. 150
Marsh Heating Equipment Co. ..... *
McCord Corp. ..... *
McDonnell & Miller, Inc. Outside Back Cover
Mercoid Corp., The ..... *
Mettler Co., Inc., The ..... *
Mid-Continent Metal Products Co. 180
Midwest Piping & Supply Co. 149
Minerallac Electric Co. 197
Minneapolis-Honeywell Regulator Co. .... 168 & 169
Modine Mfg. Co. 48
Muckle Mfg. Co. 203
Mueller Brass Co. 6
Mueller Furnace Co., L. J. ..... *
Multi-Vent Div., Pyle National Co. 181
Mundet Cork Co. 139
Mystik Adhesive Products ..... *

Nash Engineering Co. 68
National Heater Co. ..... *
National Radiator Co., The ..... *
National Tube Co. 44
Nelson, Herman Div. of American Air Filter Co., Inc. 141-144
Nesbitt, Inc., J. J. 64
New York Blower Co., The ..... *
Niagara Blower Co. 189
Nicholson & Co., W. H. 197

Ohio Brass Co. ..... *
Ohio Injector Co. ..... *
Olson & Company, Arthur A. 162
Orr & Sembower, Inc. ..... *
OverHead Heaters, Inc. 146
Owens-Corning Fiberglas Corp. ..... *

Peerless Elec. Co. 188
Peerless Pump Div., Food Machinery & Chemical Corp. 155
Penn Electric Switch Co. ..... *
Perfex Corp. ..... *
Penn Ventilating Co. 175
Pittsburgh-Corning Corp. 147
Porter & Co., H. W. ..... *
Powers Regulator Co., The 21
Prat-Daniel Corp. ..... *
Preferred Utilities Mfg. Co. 193
Pritchard Co., J. F. 145
Propellair, Inc. 194

R P & C Division American Chain & Cable Co., The ..... *
Ramset Fasteners, Inc. 184
Register & Grille Mfg. Co. ..... *
Reinhard Brothers Co. 202
Rempe Co. 199
Republic Steel Corp. 140
Research Products Corp. ..... *
Revere Copper & Brass, Inc. 67
Reznor Manufacturing Co. 200
Rhode Island Fittings Co. ..... *
Rhodes, Inc., M. H. 201
Ric-wiL Co., The ..... *
Ridge Tool Co. 164
Rockwell Co., W. S. 199
Roth Co., Roy E. 201
Ruppright, Siegfried 203

SKF Industries, Inc. ..... *
Sarco Co., Inc. 195
Sarcotherm Controls, Inc. ..... *
Schaub Engineering Co., Fred H. 134
Sellers Engineering Co. ..... *
Servel, Inc. ..... 38 & 39
Siemon & Co. 197
Skidmore Pumps ..... *
Smith Co., Inc., H. B., The ..... 30 & 31
Spang-Chalfant Div. of The National Supply Co. 55
Spence Engineering Co., Inc. 46
Spencer Heater 154
Sporlan Valve Co. ..... *
Spraying Systems Co. ..... *
Standard Stamping & Perforating Co. 161
Stedco Products ..... *
Stephens-Adamson Mfg. Co. ..... *
Sterling, Inc. ..... *
Sterling Electric Motors 201
Stic-Klip Mfg. Co. 198
Sturtevant Co., B. F., Div. of Westinghouse Elec. 8
Sunerior Combustion Industries, Inc. .... *
Surface Combustion Corp. 148
Swartwout Co. ..... *

Taco Heaters, Inc. ..... *
Taylor Forge & Pipe Works 9
Taylor Instrument Cos. ..... *
Thrush & Co., H. A. 28
Titus Mfg. Corp. 57
Titusville Iron Works Co., The, Div. of Struthers Wells Corp. 170
Trane Co., The ..... 24 & 25
Tri-Clover Machine Co. ..... *
Tube Turns, Inc. ..... *
Tuttle & Bailey, Inc. 152
Typhoon Air Conditioning Co., Inc. ..... *

Union Asbestos & Rubber Co. ..... *
Unistrut Products Corp. 51
United Cooling Tower Co. ..... *
United Electric Controls Co. 199
United States Air Conditioning Co. 3
United States Steel Co. 36
Utility Appliance Corp. 58

Velocity Power Tool Co. 187
Vulcan Radiator Co. ..... *

Wagner Electric Corp. 42
Waldron Corp., John 190
Walworth Co. 40
Ward Leonard Elec. Co. 166
Watson-Stillman Co. 47
Webster & Co., Warren 63
Webster Engineering Co., The ..... *
Weil Pump Co. 192
Welding Fittings Corp. ..... *
Western Engineering & Mfg. Co. 197
Wheatland Tube Co. ..... *
White-Rodgers Electric Co. ..... *
Whitlock Mfg. Co. ..... *
Wiegand Co., Edwin L. ..... *
Will-Burt Company, The ..... *
Wilson & Co. ..... *
Wilson, Inc., Grant 200
Wing Mfg. Co., L. J. 135
Wolverine Tube Div. of Calumet & Hecla Consolidated Copper Co. 10
Worthington Pump & Machinery Corp. .. 22

Yarnall-Waring Co. 41
York Corp. ..... *
York-Shipley ..... *
Young Radiator Co. ..... *
Youngstown Sheet & Tube Co. 20

Zallea Bros. ..... *

Firms represented in this issue are identified by the folio of the page on which their advertising appears. Advertising which appears in other issues is marked with an asterisk.

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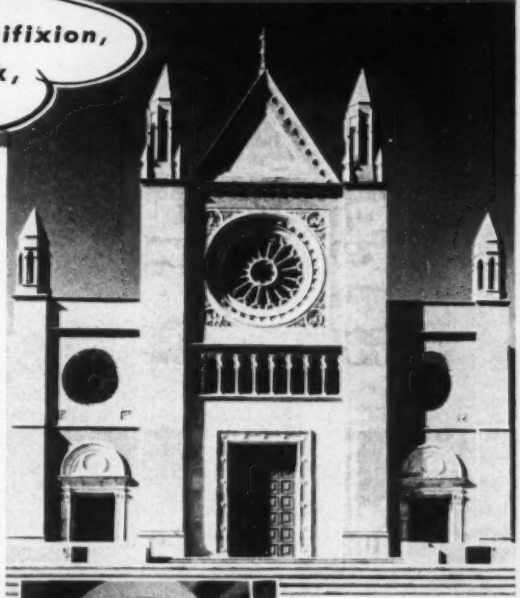
. . . . in the Hall of the Crucifixion, Forest Lawn Memorial-Park, Glendale, California



Completed in 1895, Poland's great artist, Jan Styka spent 17 years painting the Crucifixion. A city block long, four stories high (195′ by 45′) — it contains 1,182 human figures.

After 50 years in obscurity, this holy art now hangs in the new Hall of the Crucifixion — in the famous Forest Lawn Memorial-Park.

Dedicated this year on Good Friday, the Hall is an auditorium-type structure built to house the picture and permit 2,000 people to view it.

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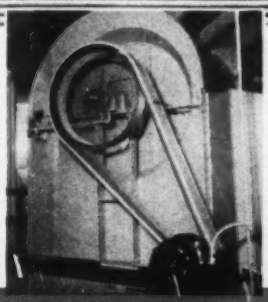

ARCHITECTS:
Architectural Department of Forest Lawn Memorial-Park

ENGINEERS:
Stockley and Bamford, Los Angeles

CONTRACTOR:
F. B. Gardner Co., Los Angeles

CLARAGE

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APPLICATION ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

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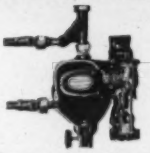


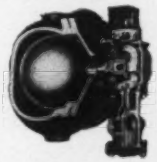
No. 47-2 **Feeder - Cut - off Combination** for automatically fired steam heating boilers up to 5000 sq. ft.

No. 147 **Boiler Water Feeder** — Similar to No. 47, but with higher feeding level for process steam boilers.

No. 247 — Same as No. 47, but for installation with 1" equalizing pipes.

No. 53-2 **Feeder Cut-off Combination** — Similar to No. 51-2, but built for higher pressure, up to 75 lbs..

No. 63 **Low Water Fuel Cut-off** — for water or steam boilers up to 50 lbs. pressure.



No. 51-2 **Feeder - Cut - off Combination** — for automatically fired steam heating boilers over 5000 sq. ft.

No. 67 **Low Water Fuel Cut-off** — for low pressure steam boilers of any size.

No. 150 **High Pressure Pump Control, Cut-off and Alarm** — for steam boilers of any size up to 150 lbs. pressure.

No. 157 **Water Column Type High Pressure Pump Control, Cut-off and Alarm** — for steam boilers of any size up to 150 lbs. pressure.

You should know ALL of these McDONNELL PRODUCTS

No. 101 **Electric Water Feeder** — operated by No. 67 or liquid level switches.

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Doing One Thing Well

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No. 21

No. 121

No. 321

No. 27

Make-up Water Feeders—to maintain adequate water supply in receiving tanks. Nos. 21, 121 and 321 are installed right in tank openings; available in various flange forms and sizes as shown to fit existing openings. No. 27 is for external application, with equalizing piping.

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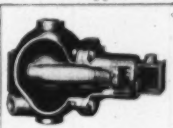
No. 417 **Snap Action Water Valve** — Maintains water level in humidifier pans and in tanks.

No. L-8 **Constant Level Valve** — Maintains constant fuel oil pressure on burner.

No. 355 **Large Capacity Float Valve** — Has many uses on tanks, stills, receivers, etc.



No. 61 **Low Water Fuel Cut-Off** — for 1" equalizing pipe installation on low pressure steam boilers.

No. 65 **Explosion-proof Electric Controller** — Underwriters' approved for hazardous locations.

No. 333 **Safety Relief Valve Assembly** —for larger hot water heating boilers. Btu. rated. ASME standard.

No. 517 **Water Level Control** — Same as No. 417, but in die cast float chamber with cover.

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No. 154 **High Pressure Pump Control** — Similar to No. 150, but with open contact switches.